SMITHSONIAN
Zoogoer
Published by **FRIENDS OF THE NATIONAL ZOO**
MARCH | APRIL | 09

Getting Out of Harm's Way
AMPHIBIANS IN DANGER

» **BAMBOO at the Zoo**
» **Animal BEHAVIOR**
» **WAKE UP to Cockadoodle Zoo**

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BRIAN GRATWICKE

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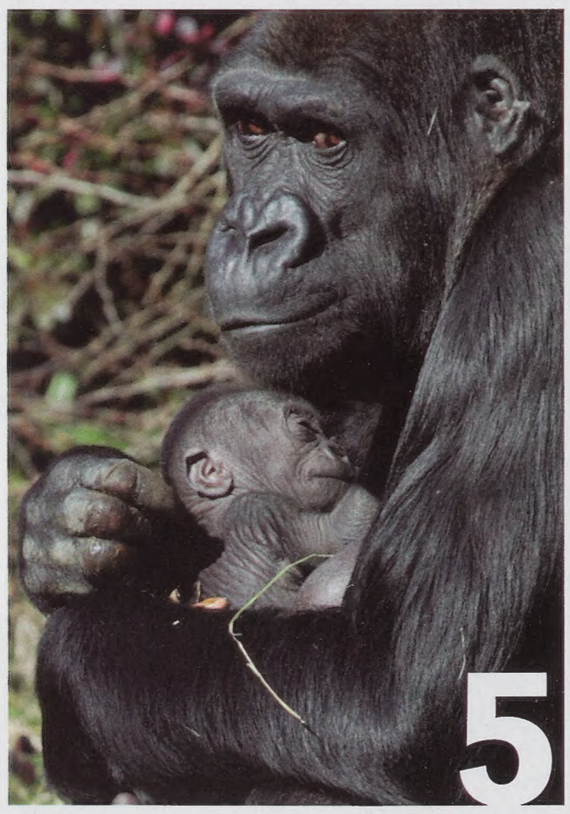

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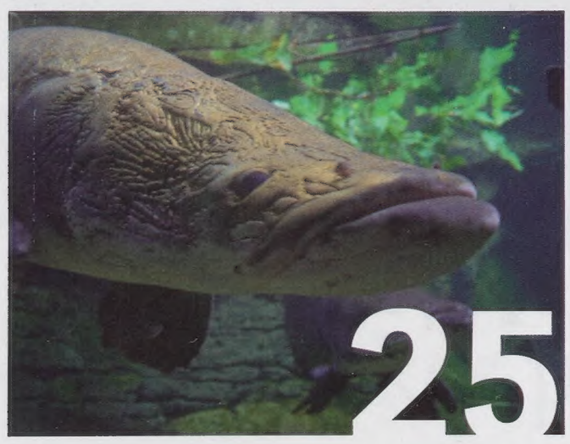

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SMITHSONIAN
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FONZ Friends of the National Zoo is the dedicated partner of the Smithsonian's National Zoological Park. FONZ provides exciting and enriching experiences to connect people with wildlife. Together with the Zoo, FONZ is building a society committed to restoring an endangered natural world. Formed in 1958, FONZ was one of the first conservation organizations in the nation's capital.

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On the cover: Panamanian golden frogs (*Atelopus zeteki*) thrive at the Zoo but are extinct in the wild. Photo by Mehgan Murphy/NZP.

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MORE THAN MEETS THE EYE

PEOPLE OFTEN ASK ME WHAT GOES ON BEHIND THE SCENES AT THE SMITHSONIAN'S NATIONAL ZOO. Of course, they're curious how our staff cares for our animals from day to day—certainly a fascinating, unseen aspect of our Zoo. But there's another dimension to animal care that goes on further behind the scenes, outside of our Zoo grounds, often outside of our nation's borders. It's the vast amount of work that the National Zoo does for wildlife conservation. Visitors to our Zoo see our wonderful animals, but they don't see the research that's happening all around the world to protect these animal species and their habitats.

One example is the vital work we are doing to save amphibians from rapid decline. That little Panamanian golden frog on the cover of this issue of *Smithsonian Zoogoer* lives in protected habitat here at the Zoo, but its relatives in the wild are thought to be extinct—wiped out predominantly by a fungus that is affecting amphibians on every continent. National Zoo wildlife biologist Brian Gratwicke has been racing the clock to assemble partner groups here and in Panama—including the Smithsonian Tropical Research Institute—to establish a center for amphibian conservation while there's still a chance to rescue this valuable class of animals (see "Leaping to Their Aid," page 10).

I'm proud of the difference our scientists make in these global efforts. One of our leaders in wildlife conservation is Steve Monfort, who heads the Zoo's Conservation & Science Directorate. Steve is smart enough to know that we can't achieve maximum success by ourselves, so he finds ways to collaborate with other organizations to train future conservationists here and abroad. He has fostered an exciting partnership with George Mason University (GMU), where each year a select group of GMU students spends a semester living and learning at the Zoo's Front Royal, Virginia, campus, taught by Zoo experts in diverse fields. We are investing our knowledge and hopes in these future conservation leaders.

Further afield, the Zoo is also partnering with The World Bank and the Global Environmental Facility to help protect tigers in their native ranges. As part of this Global Tiger Initiative, the Zoo's CRC will serve as a hub for training leaders from tiger-range countries—from India to Russia—in order to unify international efforts to save tigers from threats such as poaching and habitat destruction.

The list goes on—we have scientists making a difference in ecosystems across the globe, from the sands of the Sahara to the waters of the Caribbean to our own Rock Creek Park. The work may not be a part of the Zoo that's on view to the public, but in a way, it is visible to all of us. Every time you see signs of nature's diversity, whether it's a frog hopping by or a bald eagle overhead, it's evidence that someone is working behind the scenes to make ours a healthier planet.

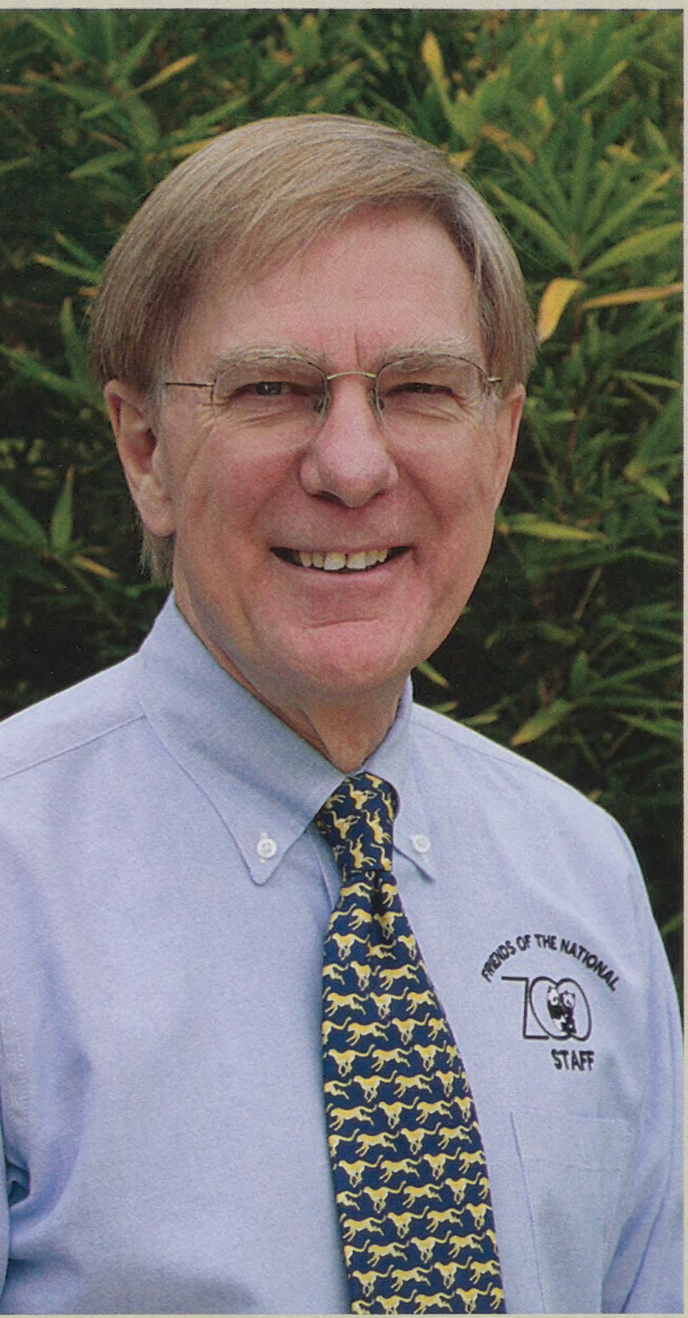
MEHGAN MURPHY/ NZP

Sincerely,

John Berry

John Berry
Director, Smithsonian's National Zoological Park

STAYING CONNECTED



JESSIE COHEN/ NZP

FIFTY-ONE YEARS AGO THIS APRIL 10, Friends of the National Zoo (FONZ) was founded as a non-profit organization to help strengthen a then-struggling Zoo. As FONZ grew from a small number of neighborhood volunteers to a staff of more than 300 full-time, part-time, and seasonal employees, it expanded its mission as well. Today, FONZ provides enriching Zoo experiences that connect people with wildlife by offering top-notch conservation education programs, providing award-winning summer camps, organizing exciting Zoo events, and hosting more than 2 million visitors annually.

As the dedicated partner of the National Zoo, FONZ works every day to provide a great visitor experience—not only for those who visit the Zoo in person, but also for those who "visit" us on our website and through our publications and electronic communications.

The partnership FONZ has developed with the Zoo is unlike any other relationship throughout the Smithsonian. This connection happens because of the fantastic people involved: our 40,000 generous members; our enthusiastic volunteers—more than 1,850 trained individuals dedicated to helping the Zoo; and, of course, our talented staff.

As FONZ embraces the wired world, we are evolving to better provide you with relevant and timely information in new and attractive formats, such as our reformatted ***Smithsonian Zoogoer*** publication and our website's newly redesigned home page. With additional website changes over the next 18 months, our members and online visitors will find it even easier to locate the information they want and need.

In addition, we will be revamping other electronic information soon. We will introduce a monthly members-only e-newsletter to include updates on FONZ activities and other special member opportunities, along with another monthly e-newsletter that will summarize the latest Zoo news. If you are currently subscribed to our electronic newsletter, you will automatically receive both of the new electronic publications. If not, please send us your email by visiting **www.fonz.org/memberemails.htm** and we will sign you up (see "Connect With Us" on page 7 for more information).

As spring warms things up here at the Zoo, we have a number of exciting events planned for the coming months. Please join us for Cockadoodle Zoo on March 14—this popular members-only event gives you the opportunity to see how the Zoo wakes up in the brisk mornings before spring arrives. In April, we welcome Easter Monday: Celebrating the African American Family (April 13), and we'll host our wonderful wine-tasting event, Grapes With the Apes (April 16). Our annual Earth Day Celebration (April 18) will give people a chance to get their hands dirty and help us clean up the environment. It will be a busy few days!

Let's continue to stay connected in 2009. Thanks again for your support!

Sincerely,

Bob Lamb

Bob Lamb
Executive Director, Friends of the National Zoo

ANIMAL NEWS

When a new baby arrives, older children often act out. The same thing can happen with apes. The Smithsonian's National Zoo welcomed a female **western lowland gorilla** (*Gorilla gorilla gorilla*) on January 10, born to 26-year-old female Mandara and 16-year-old male Baraka. Even though keepers, visitors, and Zoo staff couldn't be more excited, the baby's brother, seven-year-old Kojo, isn't as thrilled and has been acting both curious and jealous, sometimes throwing hay at mother and baby.

Kojo's half sister, 14-year-old Kigali, however, and the baby's father have been very protective of the newborn. Kigali rarely leaves mother and baby's side and Baraka makes sure that potential troublemakers like Kojo know their limits.

The newborn, who is the sixth offspring for Mandara, represents the Zoo's seventh successful gorilla birth since 1991. The baby also joins nine-year-old male sibling Kwame and 31-year-old female Haloko (Baraka's mother) at the Great Ape House. All of the Zoo's gorillas, including the newborn, remain on exhibit. Both mother and baby appear to be doing well.

MEHGAN MURPHY/NZP

The newborn represents the Zoo's seventh successful gorilla birth since 1991.

"We began monitoring the baby as soon as it was discovered and will continue to do so for weeks," says Don Moore, associate director for animal care. "All precautions are taken to ensure that Mandara and her baby are in an environment that is comfortable, safe, and controlled. Mandara is a very experienced and competent mother, and we're confident that she will continue to properly care for and bond with her baby."

By February, Mandara began swinging the baby up on her back to ride, and the baby instinctively gripped her mother's fur.

Native to tropical forests of West and Central Africa, western lowland gorillas are listed as critically endangered on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. They are primarily threatened by poaching and habitat loss and fragmentation.

The Zoo's gorillas participate in a primate Species Survival Plan (SSP), in which North American zoos collaborate to encourage the development of a self-sustaining zoo gorilla population. Working together, these zoos are helping to ensure the survival of the species. Each SSP manages the breeding of a species to maintain a healthy, genetically diverse population.

Born at the Lincoln Park Zoo in April 1982, Mandara is on loan from the Milwaukee Zoo. She came to the National Zoo in October 1985. Baraka was born at the Zoo in 1992 to Haloko and a male gorilla named Gus. In March 2004, Baraka went to the Henry Doorly Zoo in Omaha, Nebraska, and returned to the Zoo in late 2006.

For photos, updates, and more information about the Zoo's gorillas and related conservation efforts, go to http://nationalzoo.si.edu/Animals/Primates/.

MEHGAN MURPHY/ NZP

RED ALERT! A male **red panda** (*Ailurus fulgens*), Tate, recently came to the National Zoo from the Cape May County Zoo in New Jersey and is on exhibit at Asia Trail. Tate is at the Zoo with breeding recommendations from the Species Survival Plan for red pandas. Within seconds of being introduced to the female, Shama, in his new home, Tate approached her and began displaying breeding behavior.

After a gestation of about 134 days, red pandas give birth to one to four young. The cubs stay in the nest for about 90 days, remain close to their mother until the next mating season, and reach adult size at about 12 months. Adult red pandas usually live alone.

Slithering to an exhibit near you: a new **Burmese python** (*Python molurus bivittatus*) now lives at the Reptile Discovery Center. The Burmese python is one of the largest snakes in the world and can grow up to 20 feet long. Females are generally larger than males. In the wild, it is found in the rainforests of Southeast Asia living in water, on land, or in trees.

The Zoo is now home to Billie Jean, an active three-year-old female **spectacled bear** (*Tremarctos ornatus*). She came from the San Antonio Zoo to eventually breed with Nikki, the Zoo's only male spectacled bear. The National Zoo is also home to female spectacled bear Bandit, who is 32 years old—senior for a bear.

South America's only bear, this furry mammal lives in the Andes, inhabiting a variety of terrain. Where does it get its name? From the whitish "spectacles" that ring each of its eyes. The spectacled bear is listed as vulnerable on the IUCN's Red List of Threatened Species.

New birds are joining the Zoo's flock. Three **red-crested cardinals** (*Paroaria coronata*) are now part of the Zoo's collection. Two will likely go on exhibit in the Bird House, and the other, a female, may head to the rainforest exhibit in Amazonia along with two **blue-gray tanagers** (*Thraupis episcopus*). Also, a female **smew** (*Mergellus albellus*) will eventually be paired up with a male in the Outdoor Flight exhibit at the Bird House.

JESSIE COHEN/ NZP

MEHGAN MURPHY/ NZP

MEHGAN MURPHY/ NZP

AND MANY MORE...

The National Zoo wishes a happy 14th birthday to Bati, our male Speke's gazelle, on May 6. The nation's oldest Speke's gazelle, Bati has lived almost triple his expected lifespan—and he's an ornery old guy. Bati only stands as tall as a dog, on delicate legs, but he confronts larger animals at the Cheetah Conservation Station, seemingly "convinced that he's about ten times bigger than he really is," says biologist Craig Saffoe. Because of this track record, Bati swaps places with the scimitar-horned oryx and is on exhibit solo during the Zoo's early or late hours. Around people, though, Bati sweetly sidles up to the fence for treats. He's also known for his quick-growing hooves, which curl slightly upward, causing him to do "a high-step canter," Saffoe says. Keepers need to file his hooves down.

JESSIE COHEN/ NZP

EXHIBIT NEWS

Work is moving along on **Elephant Trails,** which will provide expanded habitat for our Asian elephants. Support the Zoo's conservation of this endangered animal at www.fonz.org/elephanttrails.htm.

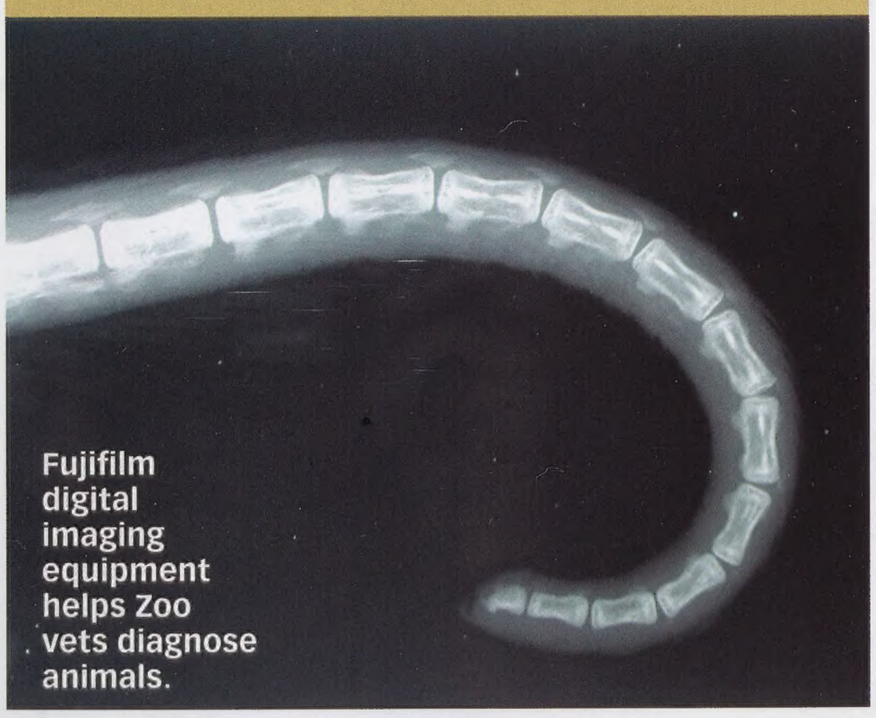
Spring brings new features to our **Amazonia Exhibit**, including a new "Science on a Sphere" globe and info on the Zoo's role in protecting amphibians.

JESSIE COHEN/ NZP

BE A VET ONLINE

Kids get a chance to think like a Zoo veterinarian when they visit **Vet Stories** online at http://nationalzoo.si.edu/goto/vetstories. Test your ability to diagnose a cheetah, give an otter a checkup, or see what's wrong with a porcupine's tail.

You can learn more about fascinating medical cases at the Zoo by visiting **Spotlight on Vet Medicine** at http://nationalzoo.si.edu/goto/vetmedicine.

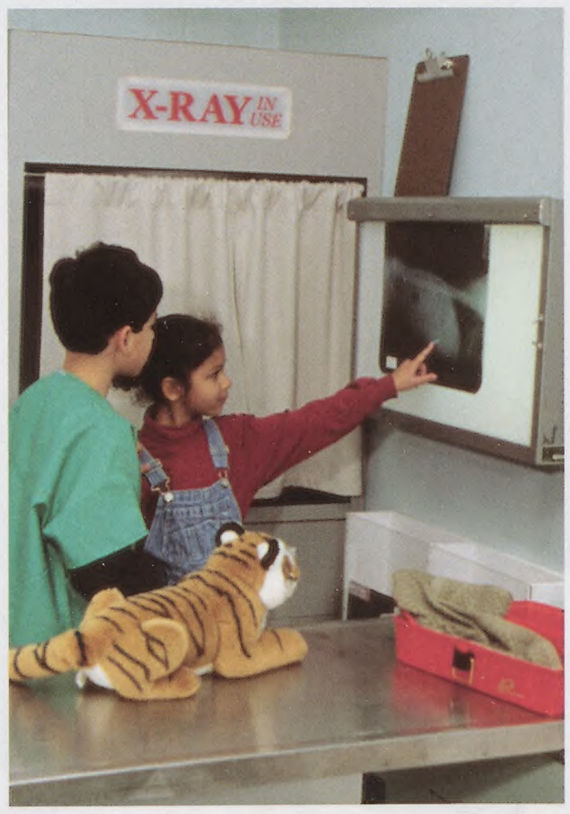


Fujifilm digital imaging equipment helps Zoo vets diagnose animals.

NZP VET TECHNICIAN

LIKE TO ROLE-PLAY?

You might like volunteering at How Do You Zoo? This exhibit guides young children (and their parents or teachers) as they role-play at various Zoo jobs.



JESSIE COHEN/ NZP

Volunteers in this program must be interested in working with children, be flexible, have good communication skills, a good imagination, and a sense of humor. Volunteers must also be willing to be on their feet for a busy, three-hour shift.

Interpreters work a flexible schedule of three three-hour shifts per month for the first year, attend monthly program meetings, and support education-based special events. We are recruiting for both weekday and weekend volunteers. You must be at least 18 years or older to apply.

Training for this program takes place on two weekday evenings and two weekend days in late May. Volunteers must attend all of the sessions to participate in the program.

Contact the FONZ volunteer office at 202.633.3025 or go to www.fonz.org/volunteer.htm to receive an application. The deadline for receiving applications is May 8; interviews will be conducted by May 11.

CONNECT WITH US

Want to receive the latest information from Friends of the National Zoo—and help conserve resources?

Provide FONZ with your current email address, and we will send you twice-a-month electronic newsletters, member email updates, and other up-to-date Zoo news—often before the news is released to the general public.

Please visit www.fonz.org/memberemails.htm to update your member information. Also, please take a moment to select your areas of interest, such as events and camps, young professionals, conservation and research, and animal news (which includes special information about our pandas, gorillas, elephants, kiwis, and more).

Help us reduce paper use and promote sustainability by providing us with your email today.

Mark Your Calendar

March 14	Rise and shine for Cockadoodle Zoo, when the Zoo opens early for FONZ members only. Turn to page 29 for your invitation/parking pass, and visit www.fonz.org/zoomorning.htm for a schedule and map.
April 1	Zoo summer hours begin: Park opens 6 a.m.-8 p.m.; animals on exhibit 10 a.m.-6 p.m.
April 7	Snore & Roar registration begins at www.fonz.org/snoreandroar.htm.
April 13	Come to Easter Monday: Celebrating the African American Family.
April 16	Sample regional wines at Grapes With the Apes; find out more at www.fonz.org/afterhours.htm.
April 18	Join us for a Zoo cleanup in honor of Earth Day.
April 30	To kick off Bird Fest, noted British ornithologist Nigel Collar lectures at 8 p.m.
May 2-3	Bird Fest 2009 is our weekend celebration of International Migratory Bird Day; go to http://nationalzoo.si.edu/birdfest for more information.

LOOK FOR THE FONZ MEMBER SECTION STARTING ON PAGE 29 FOR INFORMATION ABOUT EVENTS, CLASSES, CAMPS, AND MORE! Be sure to turn to the FONZ section in each issue of *Smithsonian Zoogoer* to stay up to date on the latest exciting happenings at the Smithsonian's National Zoo.

Shop at the National Zoo and see what blooms.

Spring is here and there's no better time to visit the National Zoo. The weather is warm, the birds are chirping, and the animals are frisky. Right now, we're offering spectacular cherry-blossom-themed gifts at the Zoo and on our website, nationalzoo.si.edu, to help you remember your visit. After all, fun blossoms in more places than the Tidal Basin.

Join Corkey Hay DeSimone, author of *Cherry Blossom Friends*, for a book signing and cherry blossom craft-making. Sunday, April 5; noon-3 p.m.

HEALTHY START

Wendy Kiso, a pre-doctoral research fellow at the Smithsonian's National Zoo, stares through her microscope for hours at elephant sperm. These tiny swimming cells made by males enter the female elephant's body during mating. A single sperm enters the oocyte, or egg, to give rise to a growing baby elephant.

As part of her research, Kiso checks the sperm cells' health. Are they swimming energetically? Are their heads nicely oval-shaped? Kiso works to understand why some bull elephants produce poor quality sperm, and she develops novel methods to store sperm for breeding programs nationwide.

"Pretty much within 30 years, elephants will become extinct in North American zoos if they don't start reproducing [more]," Kiso says. To breed elephants, scientists impregnate females with sperm from males whose genetics complement the female's. The process of artificial insemination (AI)—pioneered at the National Zoo in collaboration with scientists from the Institute of Zoo and Wildlife Research in Berlin—works well. The tricky part is consistently collecting healthy semen—the liquid containing the sperm cells—and shipping it between zoos before the sperm die.

JESSIE COHEN/ NZP

Wendy Kiso studies elephant sperm at the Zoo.

To help solve these problems, Kiso travels to other zoos, collects semen samples, and conducts reproductive exams on bull elephants. She teaches keepers how to collect semen from the elephants—by massaging sperm-storing glands near the bladder. That can sometimes make the animals urinate, ruining the semen. "Good samples don't come often," says Kiso. "Luckily, for elephants, volume isn't an issue."

Even the healthiest sperm samples only last hours or days, so Kiso and her colleagues at the Zoo's Department of Reproductive Sciences are studying various chemical brews to protect elephant sperm during freezing. Kiso freezes sperm samples in plastic straws, trying varied freezing speeds and protective chemicals. Later, she thaws the samples and examines how the sperm fared. She checks how they're moving, and studies the rounded cap on the sperm's head—the acrosome—for damage. If it's damaged, a sperm can't enter the egg. Kiso says she examines so many slides that she sometimes gets motion sickness.

As freezing techniques improve, Kiso says zoos could pick the best frozen elephant sperm from storage to artificially inseminate a female. Kiso continues working toward that goal at the Zoo, while also working toward her doctorate from George Mason University. She says developing better semen storage and freezing techniques might help our young Asian elephant, Kandula, become a father someday.

— HAYLEY RUTGER

» In each issue of *Smithsonian Zoogoer*, this **"How Do You Zoo?"** page will showcase someone who works at the National Zoo. Learn more about careers at the Zoo by visiting the How Do You Zoo? exhibit at the Zoo's Visitor Center.

LEAPING TO THEIR AID

As amphibians continue to decline faster than any other group of vertebrates, Smithsonian scientists and their partners work together to save them.

BY DAN STONE

A FEW YEARS AGO, WHILE RESCUING FROGS IN PANAMA, Smithsonian National Zoo biologist Matt Evans and his colleagues were in a pinch. After removing the amphibians from the path of a deadly microscopic fungus also known as chytrid, they had no place to hold the rescued frogs while an evacuation center was built. So what did they do? What any resourceful scientist would do: put them up in a hotel.

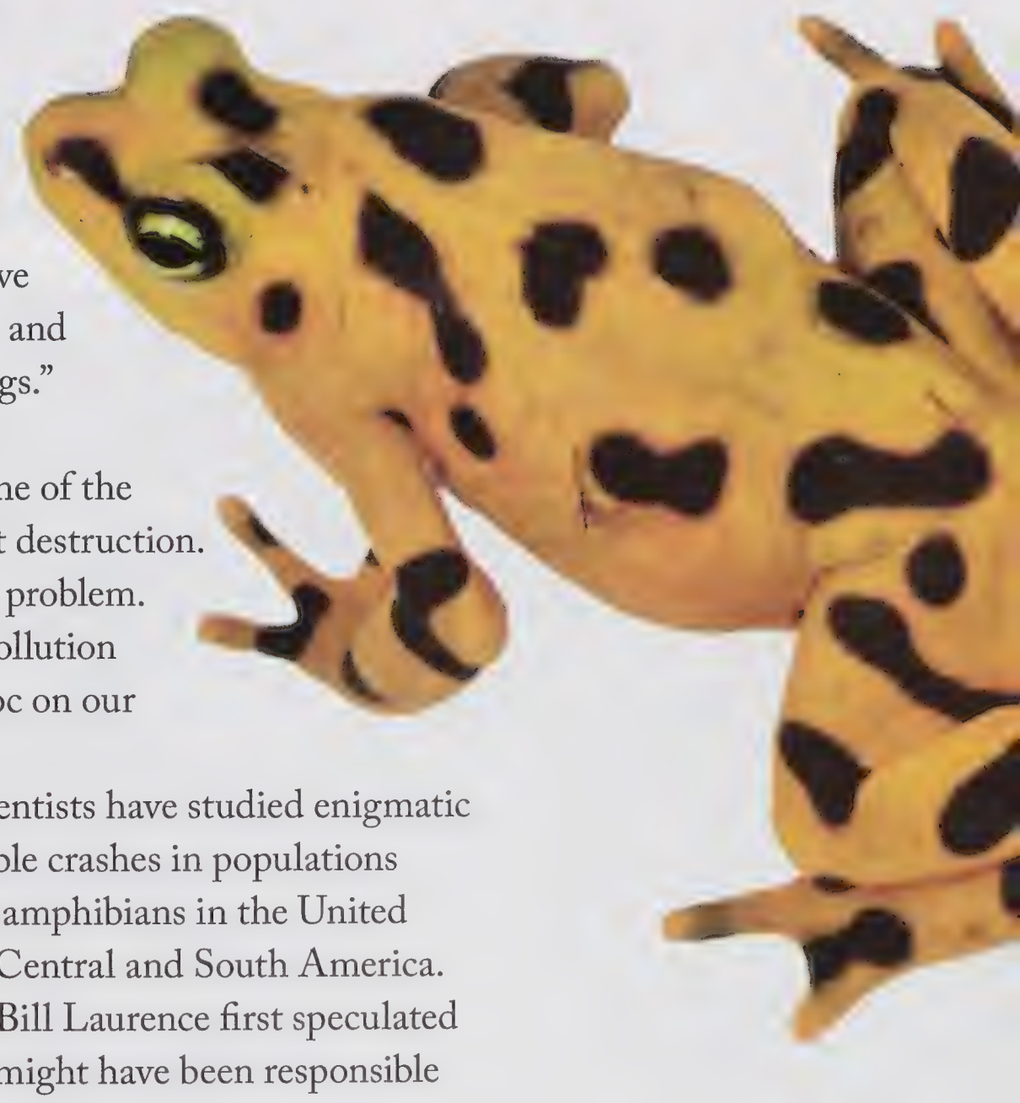
Evans, who at the time worked for the National Aquarium in Baltimore, went to Panama as part of a rapid response team that was helping save a number of species in the path of the dangerous fungus. "We had to act quickly," Evans says. "Chytrid was already devastating some of the area's amphibian population, so we targeted specific species in specific localities."

After they caught the frogs, Evans and his associates tested them for the fungus and then brought them to a hotel near the El Valle de Antón region of Panama. The hotel actually donated a few of its rooms and a holding facility for the cause. "It was an amazing sight to see all these rare frogs together in a few rooms," says Evans. "From June to August 2005, 42 species and 624 amphibians were collected as part of this project. Most frogs were housed in individual containers prior to their trip to the United States via our carry-on luggage."

Amphibian Decline

With each passing day, amphibians around the world continue to disappear. A recent five-year survey by the International Union for Conservation of Nature (IUCN) and Conservation International of all 5,743 known amphibian species—including frogs, toads, salamanders, and caecilians—found that 42 percent were in danger of extinction. This number is much higher than any other class of vertebrates, including birds (13 percent are threatened with extinction) and mammals (26 percent). Scientists believe that at least 122 amphibian species have gone extinct since 1980, compared to five bird species and no mammals.

"As a group, amphibians have the same evolutionary importance as mammals, and what's happening to them could happen to mammals—including humans," says Claude Gascon, executive vice president of programs and science at Conservation International. "That should open our eyes to our collective footprint on the planet and its effect on living things."



What's to blame for amphibian decline? One of the main culprits is habitat destruction. But that's not the only problem. Climate change and pollution are also wreaking havoc on our amphibian friends.

Since the 1980s, scientists have studied enigmatic declines and inexplicable crashes in populations of mountain-dwelling amphibians in the United States, Australia, and Central and South America. Smithsonian scientist Bill Laurence first speculated in 1996 that a disease might have been responsible for these population reductions. He was right; in 1999, scientists at the Smithsonian's National Zoo and University of Maine discovered the chytrid fungus and determined that it was the cause of a deadly amphibian disease (see "More Than Skin Deep," page 13).

"The Zoo's discovery of the fungus completely changed the way scientists and conservationists viewed amphibian declines," says Brian Gratwicke, interdisciplinary research biologist at the National Zoo. "Many historic disappearances of species were then re-examined and attributed to the chytrid epidemic."

JESSIE COHEN/ NZP

BRIAN GRATWICKE/ NZP

BRIAN GRATWICKE/ NZP

A Crisis in Panama

Recent investigations by scientists have documented the wave-like spread of chytrid through the mountainous regions of Central and South America. One of these scientists, Karen Lips, a Smithsonian associate, has studied the fungus in Panama and parts of South America since the early 1990s. From conducting disease surveillance to testing frogs to predicting where chytrid will hit next, Lips has been on the front lines of amphibian conservation for years.

"I've seen chytrid's devastating effects firsthand," she says. "Before it enters a site, the area is abundant with life and has a high diversity of amphibian species. Then, almost instantly, there is sort of this widespread infection and within four months the abundance of amphibians and numbers of species significantly decrease."

Even Panama's national symbol, the Panamanian golden frog (*Atelopus zeteki*), has suffered at the hands of chytrid. Many scientists believe these frogs are now completely extinct in the wild because of the fungus and habitat loss.

Thus far, scientists have determined that chytrid travels about 13 miles a year in Central America. When, as predicted by Lips, chytrid arrived at El Copé in western Panama in late 2004, species from all seven frog families in the area started dying. "Within months, half of all the species vanished all together, and the abundance of many surviving species plummeted to about 20 percent of what it should be," says Gratwicke.

Continuing its spread eastward, the fungus arrived in the El Valle region, about 22 miles west of El Copé, in late 2006. Here, conservationists associated with the Houston Zoo began capturing and housing species in a quarantined, managed-care facility that provided protection from chytrid exposure. Today, this small center at the El Nispero Zoo in Panama houses 50 amphibian species, 17 of which are likely extinct in the wild at El Valle.

TOP: **Panamanian golden frog at the National Zoo** BOTTOM LEFT: **Frog habitat in Panama** BOTTOM RIGHT: **Brian Gratwicke with a cane toad**

MORE THAN SKIN DEEP

The disease chytridiomycosis looms over the world's amphibians like a grim reaper. Along with habitat loss, pollution, and other problems, this fungal infection is a central reason one third of Earth's amphibians are threatened with extinction. Chytridiomycosis began killing amphibians in the 1980s, baffling scientists who had yet to name it. It has since hammered species in Australia, the Americas, Europe, Africa, and Asia.

When it struck blue poison dart frogs and other species at the Smithsonian's National Zoo in the 1990s, former Zoo pathologists Don Nichols and Allan Pessier worked with fungus specialist Joyce Longcore of the University of Maine to isolate and describe the mystery pathogen.

Nichols had studied it since 1991, after seeing diseased tissue samples from Arroyo toads while working for the National Institutes of Health. He consulted experts in algae and single-celled animals called protozoa, but the pathogen was neither. The Zoo outbreak allowed him and Pessier to examine fresh samples of the infection under the microscope. It looked like fungus. Longcore confirmed their suspicions and helped describe the new species (in a new genus), which they named *Batrachochytrium dendrobatidis* in 1999.

Nicknamed *Bd*, it is usually just called "chytrid fungus." But Earth teems with friendlier chytrid fungi. None but *Bd* harms amphibians—or anything else with a backbone. These fungi comprise the phylum Chytridiomycota, and most of them decompose dead things, while fewer parasitize plants, other fungi, or invertebrates. *Bd*, the black sheep among its kin, can kill amphibians in days or weeks by destroying their delicate skin.

Its microscopic zoospores—round clear blobs with long wiggling tails—spread through water. They infect the surface layer of amphibian skin, each developing into a growing single-celled body called a thallus. The thallus makes a sac of new zoospores and releases them through tiny tubes to begin the cycle again.

The unlucky amphibian hosts often grow sluggish and begin shedding sheets of dead skin. Their epidermis may thicken or thin in various spots, redden on the belly, or develop ulcers. The infection is just skin deep, but skin plays a vital role for frogs and their relatives—it regulates their water, oxygen, and electrolytes. Scientists still puzzle over exactly how *Bd* inflicts damage. They hope to learn whether the fungus secretes a cell-destroying toxin.

Another puzzle is the rapid spread of *Bd*. Research suggests it came from Africa, possibly with frogs exported for labs and pet stores, or even on the shoes and gear of biologists and ecotourists. Scientists also suspect that global warming encourages its growth and virulence. But a recent study suggests that neither idea—*Bd* spreading quickly from a few spots, or getting a boost from climate change—fully explains its leaps and bounds.

Scientists do know that some amphibian populations or species resist the fungus, while others fall swiftly and completely. *Bd* figured notoriously in wiping out Panamanian golden frogs. Presumed extinct in nature, these banana-yellow frogs are now bred for conservation and displayed at the Zoo's Reptile Discovery Center. But other species—or individuals within species—can carry the fungus with few or no symptoms.

These survivors might have microscopic guardian angels. Studies reveal that certain bacteria found naturally on amphibian skin kill or ward off the fungus, and that amphibian populations carrying lots of these bacteria may stand stronger against chytridiomycosis. Scientists hope such findings will lead to treatments for wild populations; currently, they use antifungal medicines on captive amphibians, but *Bd* lurks in streams and lakes, waiting for any healthy amphibians they reintroduce.

New treatments may arise, since a team at the University of Idaho cracked *Bd's* genetic code in 2008. The next step is to discover which genes make the fungus deadly.

For now, many amphibians depend on captive breeding programs of organizations like the National Zoo to evade extinction. The world's frogs, salamanders, and their kin can't leap or wriggle past this immense hurdle without our help.

—HAYLEY RUTGER

Across the Canal

Biologists had hoped that the low-lying Panama Canal region would serve as a natural barrier to the spread of chytrid. However, by late 2007, the fungus was found for the first time east of the canal in Soberania National Park. "We're not exactly sure how it crossed the canal," says Lips. "It may have traveled naturally or people may have tracked it over on their boots, cars, or trucks."

Now that the fungus has jumped the canal, Lips and her colleagues expect it will continue its eastward march toward the mountainous Darien Region, the last intact amphibian hotspot in Central America. This area contains at least 121 amphibian species—61 percent of all of Panama's amphibian fauna—and is a stronghold for about 60 species listed as critically endangered or endangered by the IUCN.

"The diversity in the Darien Region is incredible," says Evans. "It is a biological paradise—and not just for amphibians, but for many species. It would be a tragedy if anything happened to that pristine habitat."

What YOU Can Do

- Donate to the National Zoo's amphibian conservation efforts at http://nationalzoo.si.edu/goto/helpamphibians.
- Sign up for the Association of Zoos and Aquariums' Frogwatch USA program and monitor local amphibian populations at www.nwf.org/frogwatchUSA.
- Become a member of the Amphibian Ark cause on Facebook.
- Learn more about the issue and teach others about it—you could even make your own public service announcement and post it online.

Golden Frogs at the Zoo

Throughout the United States, only eight zoos breed Panamanian golden frogs (about 50 have them on exhibit). The National Zoo, which has one of the largest holding facilities for these amphibians, has bred golden frogs in hopes of contributing to a reservoir of zoo genes that will help ensure their survival.

"Four pairs of Panamanian golden frogs came to the Zoo in 2004," says Evans. "Over the years they have produced hundreds of offspring, some of which have gone to other zoos to participate in the Panamanian golden frog Species Survival Plan."

At the Reptile Discovery Center, visitors can see about 12 Panamanian golden frogs on exhibit. But this number represents only a fraction of the Zoo's entire golden frog collection; more than 80 live in an off-exhibit, temperature-controlled holding facility at the Reptile Discovery Center. All of the Zoo's current collection descended from the original pairs.

Found in high elevations and cloudy forested areas, Panamanian golden frogs need climate-controlled environments when living in zoos. An ideal temperature for them is around 70 degrees Fahrenheit with high humidity.

The more Zoo visitors learn about Panamanian golden frogs, the more fascinating they find these charismatic amphibians. "Many people don't know that golden frogs are actually toads," says

SAVING SALAMANDERS IN SHENANDOAH »

BRIAN GRATWICKE/NZP

Evans. "They are from the genus *Atelopus*, but from the family *Bufonidae*, which are true toads. Of course, their appearance is quite different from other toads and they don't have warty skin."

In the wild, Panamanian golden frogs eat mites and ants that make them poisonous. Since their Zoo diet doesn't include these insects, the Zoo's collection carries no threat for keepers or other animals.

A Potential Cure?

Among frog populations in zoos, the chytrid fungus can be eliminated with fungicides. But using massive amounts of this treatment in the wild would likely cause irreparable harm to natural ecosystems, probably without stamping out all the chytrid fungus. That's why Reid Harris, a biology professor at James Madison University in Virginia, is studying an alternative solution. He and his colleagues recently identified several species of bacteria that live on the skin of certain amphibians. But these are no ordinary bacteria—they produce anti-fungal chemicals that inhibit the growth of chytrid.

One of Harris' most promising studies involved treating uninfected mountain yellow-legged frogs with the anti-chytrid bacterium. Of the frogs treated with the bacterium, 100 percent survived exposure to the chytrid fungus. In another study, 13 chytrid-infected frogs treated with the bacterium lost less weight when compared with untreated individuals. Weight loss is one symptom of chytrid infection.

Smithsonian research associate Louise Rollins-Smith plans to build on Harris's work. She and her team at Vanderbilt University are hoping to find a way to protect amphibians in Panama, either by vaccination against the chytrid fungus or by finding some kind of bacterium on a Panamanian amphibian that is similar to what Harris found on the skin of mountain yellow-legged frogs. "Our research is helping us understand the immune response of Panamanian amphibians," Rollins-Smith says. "We hope to use that information to help save them."

Rollins-Smith and her colleagues believe frogs' skin holds benefits for humans, too. They are researching whether certain antiviral peptides in amphibians' skin may prevent the transmission of the HIV/AIDS virus. "If we lose amphibians, we lose the opportunity to study the medicines that might be found in their skin," she says. "We must do all we can to ensure their survival."

COMING THIS SPRING, the Zoo's Amazonia exhibit will include new amphibian displays, including interactive features and information about chytrid. Hop on over and take a look!

When you think about animals thriving in the Shenandoah Mountains, you probably think of white-tailed deer, black bears, or maybe woodpeckers. But what about salamanders? Both red-backed and Shenandoah salamanders are important members of the mountain community.

Scientists believe the endangered Shenandoah salamander, which is found on only three mountaintops within Appalachia, may be threatened by climate and habitat changes. To help this amphibian, Jennifer Sevin, a biodiversity conservation specialist at the Smithsonian's National Zoo, has launched a salamander conservation program for the Zoo in Shenandoah National Park as part of her Ph.D. dissertation research.

"The Shenandoah salamander is a terrestrial amphibian that has a very limited range and requires cool, moist, rocky areas for survival," says Sevin. "And even though they've been around for about five million years, scientists unfortunately know very little about what affects them and how we can protect their future."

Sevin and her team began observing the salamanders' habitat range and population dispersal in 2007. During 2008, they surveyed 124 sites across three mountaintops, visiting each site nine times.

So far, Sevin and her colleagues have found no evidence of hybridization (breeding) between the red-backed and Shenandoah salamanders. They did discover, however, that Shenandoah salamanders breed in the fall and spring—a fact that had never been documented by any scientist.

But those aren't their only discoveries. On a visit to Stony Man Mountain, Sevin and her colleagues found a Shenandoah salamander nest site—the first ever of its kind. "My field technicians and I were ecstatic with this find," says Sevin. "The nest site is helping us understand the life history of this species and habitat conditions necessary for its survival."

Chytrid, the microscopic fungus that can cause a fatal disease in amphibians, has appeared all over the world—even in Virginia and Shenandoah National Park. During 2009, Sevin's team will conduct research to determine whether chytrid is detected on Shenandoah salamanders.

Along with more hybridization research, Sevin plans to study the competition between red-backed salamanders and Shenandoah salamanders in 2009. She believes the former are forcing the latter to remain in rocky areas on the tops of mountains.

"Conservation management of the Shenandoah salamander is dependent on understanding as much as we can about the species," says Sevin. "We have already learned a lot about these amphibians and we look forward to finding out more this year about natural and human factors that affect them." —*DAN STONE*

BEHAVING naturally

BY JODI LEGGE

Smithsonian National Zoo Fujifilm curatorial resident Erika Bauer specializes in studying why animals behave the way they do.

JANET BENNETT/ NZP

When Erika Bauer came to work at the National Zoo in April 2007, she could not have imagined the impact she would have in the area of animal behavioral studies. Bauer not only initiated new and important research, she also started an extremely successful internship program focused on observing animal behaviors and investigating how these behaviors can indicate the overall health and happiness of animals living in a zoo environment.

Bauer came to Washington, D.C., with a doctoral degree in psychology and a strong focus on animal behavior. Originally from Pittsburgh, Pennsylvania, she always had a love for animals and worked in animal shelters during her high school years. As an undergraduate at John Carroll University in Ohio, she had the opportunity to work with a visiting professor researching chimpanzee behavior at the Cleveland Zoo. In that first foray into zoo research, Bauer spent many hours collecting data about how often the chimps used the environmental enrichment devices provided to them, and how social they were with one another.

This jump-started her passion for behavioral research, which she continued while working at the Pittsburgh Zoo after college, and then by pursuing a graduate degree at the University of Michigan in Ann Arbor. Her doctoral work focused on a comparative study of social play style in three species: chimpanzees, bonobos, and domestic dogs. "The dog study provided a convenient reason to go to the dog park in the name of research!" she says. Bauer was chosen from many interested and qualified candidates to be the National Zoo's first Fujifilm curatorial resident as part of a two-year fellowship program; the Zoo didn't have a behaviorist on staff and was very interested in her specific area of expertise.

"At the National Zoo, my research can have a direct impact on the animals I study," says Bauer. "So this is essentially my dream job."

Soon after she started her fellowship, Bauer realized that there was enormous interest in her research. National Zoo curators and keepers had many questions about the animals they cared for. Why does the male sloth bear pace back and forth, and what would reduce that behavior? How does altering the tank environment or introducing new objects or stimuli affect behavior of octopus and cuttlefish? How does the Zoo environment, with its high visitation rate and ongoing construction noise, affect the behavior of the animals that live here?

MEHGAN MURPHY/ NZP

Inquiring Interns

The first thing Bauer did was to develop an internship program focused specifically on behavioral research. During each three-month term, these interns would be assigned a specific question to study and would develop a hypothesis about a specific aspect of animal behavior that was of interest to them.

One intern, Courtney McLaughlan, wanted to study the behavior of the Zoo's Asian elephants. "I decided to study the dominance-related interactions between the two female elephants, Shanthi and Ambika, to see which one was more assertive and which one was more submissive," she says.

Once a hypothesis was established, the intern worked on developing an ethogram—a list of behaviors related to the research question, and their corresponding behavioral definitions. This research tool allows the interns to catalog data during eight weeks of field research. This typically includes spending several hours each day observing specific animal behaviors and working closely with animal keepers. Throughout the observation phase, the interns continuously collect and enter data into a spreadsheet.

For McLaughlan's elephant study, she monitored Shanthi and Ambika to look for assertive behaviors, such as pushing, head-nudging, and claiming food from the other elephant's mouth, trunk, or body. She also watched for deferent behaviors—backing away from or relinquishing food to the other female.

"My average day began earlier then most of the other interns. I would come in at 7:30 a.m. to observe the elephants until at least 9 a.m., and I would come back for another observation midday," says McLaughlan.

She observed that Shanthi was the one that usually initiated interactions, and she exhibited assertive behaviors in the vast majority of interactions. But she also noted that keepers had observed some striking examples of Ambika asserting dominance over Shanthi. Another interesting twist was that interactions between the two females were much more likely to occur if Kandula, Shanthi's male offspring, was nearby.

"Data collected in this study indicate that these two female elephants display the sort of pattern that is characteristic of an egalitarian social relationship, and Kandula is an important factor in their interactions with each other," explains Bauer. "No single pair stands alone in such a tight-knit group. The relationship between Shanthi and Ambika is complex, and it's these sorts of complexities that make it fun for researchers—we're always developing new questions to answer and examining the puzzle of social life."

After collecting the data, McLaughlan and the other interns are required to conduct a detailed analysis of the data, write a scientific paper, and present their results to Zoo staff. Their presentations include recommendations for improving animal care based on the results of each study.

All along the way, the interns have the opportunity to interact with Zoo staff, who Bauer says are vital to the research. "One of the most important aspects of this residency was learning just how important the keepers are to our animals here at the National Zoo," says Bauer. "Zookeepers have an incredible amount of work to do every day, yet they are so in tune to the needs of the animals they care for, and can detect subtle behavioral differences that most people wouldn't notice. Without their support and their concern for the animals, we would never have been able to conduct this type of research."

Research and Results

During her two-year tenure at the National Zoo, Bauer has successfully mentored 19 interns, sometimes being responsible for six students at a time. Bauer helps the students brainstorm ideas and develop their hypotheses, and she works closely with them as they analyze their data and write their papers and presentations. The interns selected for the program include students of various educational levels (high school, undergraduate, and graduate students), with interests ranging from understanding natural animal behaviors to animal enrichment and animal health. Of course, the interns also must have a deep interest in animals and a willingness to work in unusual places at unusual hours, often observing behaviors for long periods of time.

Many of the interns came to the Zoo with a study question already in mind.

ABOUT Behavioral Science

Behavioral scientists study the interactions between different animal or human groups, within groups, or between groups and their environment. There are many different specializations within the behavioral science field, including psychology, psychobiology, social research, anthropology, sociology, and social networks.

These scientists often work in the field and in real-life situations, versus in laboratories or isolated academic projects. The research done in zoo settings can be extremely helpful, especially involving species whose behaviors keepers don't fully understand.

MEHGAN MURPHY/ NZP

Others were given ideas from Bauer or the Zoo's curators and keepers. The interns have conducted research at the Zoo in Washington, D.C., as well as at the Zoo's Conservation and Research Center in Front Royal, Virginia. Some of the behavioral studies conducted over the past two years include:

- What is giant anteater reproductive behavior like, and how do the anteaters react to environmental noise?
- How can environmental enrichment and social companionship help to reduce pacing in Merlin, the Zoo's adult male sloth bear?
- What are the social dynamics in the Zoo's group of six Asian small-clawed otter brothers?
- What behaviors do double-wattled cassowaries exhibit in captivity? How can enrichment lead to variations in behavior?
- What is the relationship between the Zoo's two female Asian elephants, Shanthi and Ambika? Is one female more dominant?
- How can the behavior of the male cheetahs be used as a predictor of the estrus cycle of the females?
- How does enrichment affect the behaviors of giant Pacific octopus and cuttlefish?

The outcome of this research has been shared with National Zoo staff, often resulting in modifications to animal care procedures. Some of the studies have also been published or submitted for publication in peer-reviewed scientific journals and animal management newsletters.

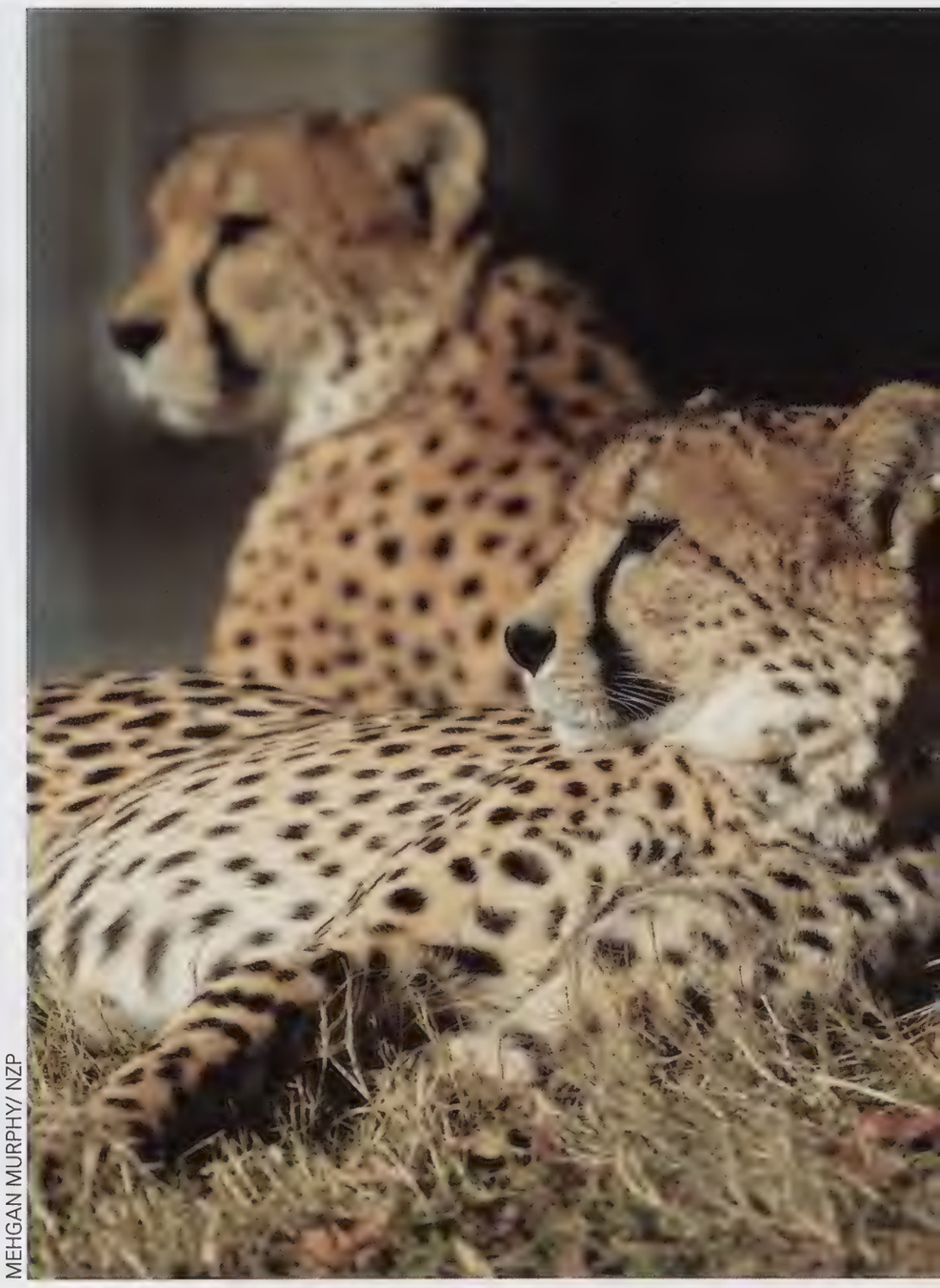
Leaving a Legacy

Because her funding has ended, Bauer's two-year fellowship with the National Zoo will also end in April, along with the behavioral research internship program that she began. In an effort to keep the research going, she has worked closely with Friends of the National Zoo to ensure continued involvement of the Behavior Watch program, through which volunteers are trained to collect behavioral data. As to her future, Bauer is looking at various positions with other zoos across the country, and she noted that her priority is to keep working in a zoo setting.

"This has just been an amazing experience for me," says Bauer. "The timing was perfect and it changed my life. Don Moore [associate director of animal care at the National Zoo] has been extremely supportive of behavioral research and the staff here has been phenomenal. The keepers are truly the unassuming experts on the animals they care for.

"Not only did I have the opportunity to conduct research in my chosen field, but the training and mentoring experience with the interns has given me a renewed passion to develop opportunities for new scientists in the future. There are so many students interested in behavioral research, but so few positions available out there. We have to find a way to support these brilliant young minds."

FACING PAGE: **Courtney McLaughlan studies Asian elephants.**
RIGHT: **Cheetah research leads to breeding success.**
BELOW: **Giant anteaters interact.**



MEHGAN MURPHY/ NZP

CASE **Study**

ANN BATDORF/ NZP

Erin Bukofsky has always been interested in animals, and she previously worked in an animal care and rehabilitation center. It was there that she became interested in animal behaviors.

"It was fascinating to me to observe how different circumstances affected animals in different ways," she says. "When I learned about the National Zoo's internship program, I was very excited. My study question involved the giant anteaters, observing the behavior between the male and the female after the female had finished raising her daughter and was reintroduced to the male.

"I wanted to find out if they were still interested in each other after being apart, and for the female, the question was whether she would still be interested in the male after giving birth. During this reintroduction, some construction was taking place close to the anteater habitat. It seemed that the loud noises decreased the male and female's interest in each other and affected their interactions. This added an interesting element to my observations.

"As an intern, my day typically began at 10 a.m., when I would observe the anteaters in their outdoor habitat for several hours. This was usually interesting, but sometimes it would get a little boring, especially if they were inactive and the weather was poor. It was always fascinating to note the behavior of the Zoo visitors as well—they would often stare at me, wondering who I was and what I was doing with my notebook, rather than focusing their attention on the anteater!"

Bukofsky says she really enjoyed her experience at the National Zoo and plans to go back to school to get her master's degree. She'd like to work as a zoo curator one day, and would also love to find a job where she can continue to study animal behavior.

JESSIE COHEN/NZP

Bamboo serves diverse purposes at the Zoo and around the world

FROM Shoots TO Stands

BY SUSAN LUMPKIN

NO BOUNCING BABY ANYMORE, THREE-YEAR-OLD GIANT PANDA TAI SHAN is now tipping the scales at a near-adult weight of about 185 pounds. With this comes a grown-up panda's hearty appetite for bamboo, which is essentially all any giant panda eats. This presents a giant-sized challenge for the Smithsonian National Zoo's staff who must keep up with the demand for ever more of the stuff.

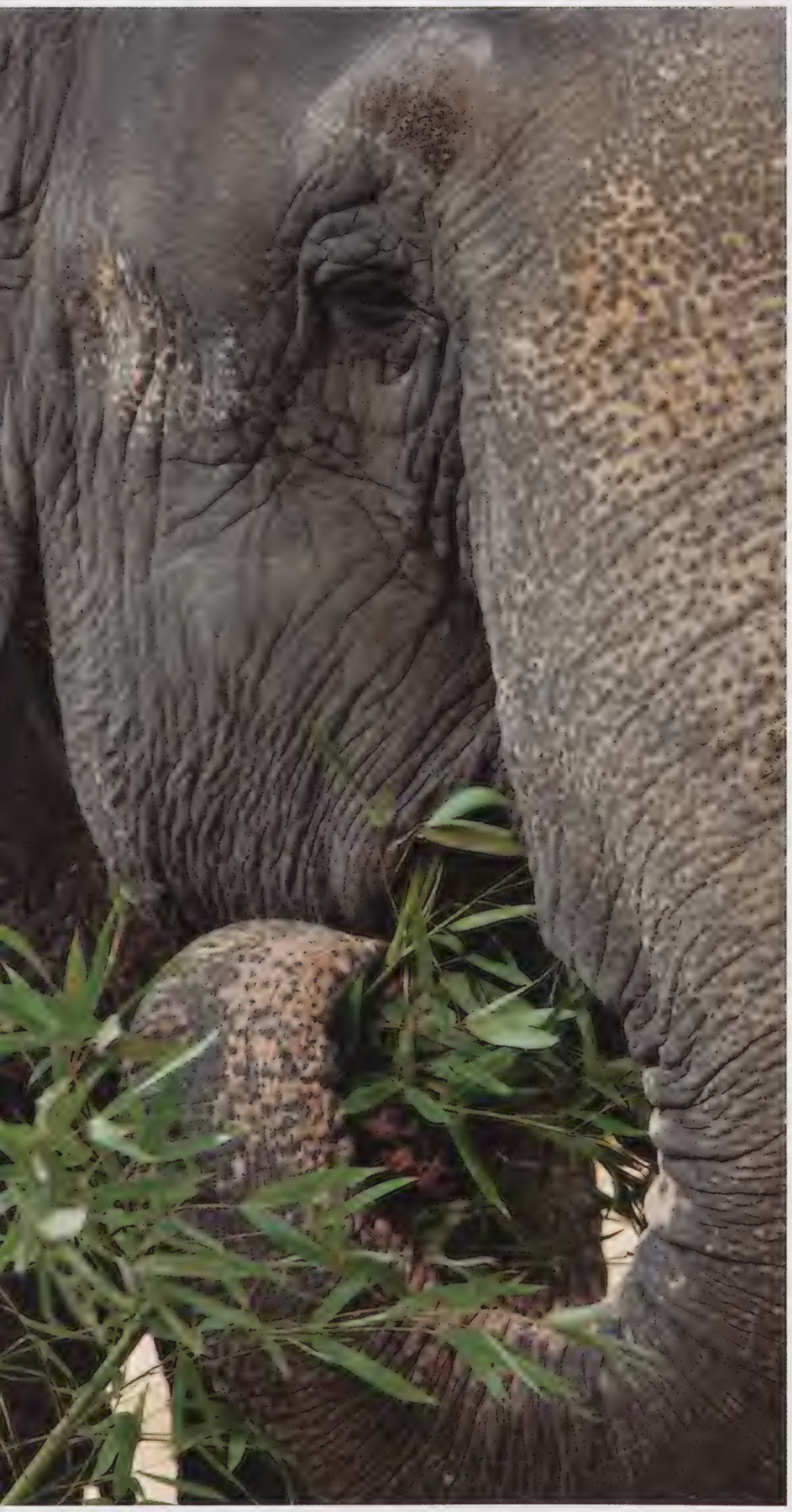
In fact, the Zoo's head of nutrition, Mike Maslanka, says harvesting bamboo is arguably the hardest job at the Zoo. If you have ever taken a whack at controlling bamboo in your own backyard, this may come as no surprise. The woody stems, or culms, don't yield easily to clippers.

Maslanka and his team are responsible for cutting all the bamboo that keepers feed to the Zoo's three giant pandas—as many as 400 tough stalks per day in the winter when giant pandas and other animals chow down most ravenously. In addition to serving the giant pandas 100 to 300 pieces of bamboo—up to nearly 90 pounds' worth per day—nutrition staff cater to red pandas. These bamboo-eaters each need a stalk a day. The Zoo's Asian elephants and great apes, for which bamboo is primarily an enriching supplement to their diet, each account for another 60 or so stalks.

Most of the bamboo harvested for the animals is of two types: species of *Phyllostachys*, especially yellow groove bamboo (*P. aureosulcata*), and arrow bamboo (*Pseudosasa japonica*).

These and other bamboos grow abundantly on Zoo grounds. According to Zoo horticulturalist Preston Burke, nearly five of the Zoo's 163 acres are planted with one species or another of the hardy, fast-growing grasses. Even so, there's not enough to meet the demanding appetites of three giant pandas. Green year round, bamboo beautifies the park's grounds. For this reason, bamboo is harvested from the Zoo's gardens only in emergencies and for a few days in the spring to thin out dense stands. Instead, staff trek out to the Zoo's Conservation and Research Center in Front Royal, Virginia, to a private property in Fort Washington, Maryland, and a few other local sites to cut their quota.

In all, the Zoo's bamboo collection includes about 42 different varieties, from the diminutive dwarf bamboo (*Pleioblastus pumilus*), which forms a ground cover, to towering timber bamboos such as some *Phyllostachys* species. But the Zoo hosts only a small sample of the myriad bamboo species—fascinating plants that underpin many natural habitats.



JESSIE COHEN/ NZP

ANN RAYDON/ NZP

The Zoo's giant pandas, elephants, red pandas, and other animals munch through hundreds of bamboo stalks each day.

Bamboo Diversity

Around the world, there are some nine or ten thousand species of grasses, of which as many as 15 percent are bamboos. Estimates of the number of bamboo species vary, but recent figures range from 1,200 to 1,500, with most of this number belonging to the woody bamboos. Only about 100 or so species don't have woody stems, most of them confined to the Americas, including the smallest known bamboo. Standing less than an inch tall, *Raddiella vanessiae* was just discovered in French Guiana in 2007. In contrast, the tallest woody bamboos, such as the Asian *Dendrocalamus giganteus*, may exceed 120 feet. Woody bamboos in the widespread South American genus *Guadua* grow to nearly 100 feet.

Most people associate bamboo with Asia. Indeed, China is home to the greatest number and diversity of bamboos, with 626 described species. India boasts 102 species, followed by Japan with 84. In contrast, only five species of woody bamboo grow in Africa. About 33 grow in Madagascar, and all but one of these is found only on that biologically unique island. In the New World, there are about 430 species of woody bamboos, with the greatest number—more than 130—in Brazil.

Although the bamboos that grow in North American gardens, like those at the Zoo, are almost entirely species introduced from China and Japan, there are a few native North American bamboos. One, called giant cane (*Arundinaria gigantea*), grows at the Zoo near the Reptile Discovery Center. Giant cane, which may reach 23 feet tall, was once very common in the southeastern United States. There, it grew in huge expanses of dense stands, called canebrakes, as large as four miles long and a quarter-mile wide. Canebrakes offer shelter and food to a host of animals, from black bears and turkeys to rattlesnakes and butterflies, but they have vastly diminished in extent. Early European settlers to the United States fed livestock on the cane and sheltered their animals in the brakes, but they replaced most of the stands with crop fields. The presence of cane indicated that the soil beneath was fertile, and cane was easier to chop down than trees. Scientists speculate that the loss of canebrakes may

have contributed to the decline (and probable extinction) of Bachman's warblers. These birds may have foraged for insects among the leaves and stalks, and used the stands as nesting sites and shelter.

Switch cane (*A. tecta*) is much smaller, usually under six feet, and thrives in slightly different habitat. But, until recently, it was not deemed a separate species from the giant form. Like its bigger sister, switch cane also once grew in large thickets and served as food and shelter for wildlife.

Scientists are still discovering bamboo species in North America. A third U.S. species was identified just two years ago. Called the hill cane (*A. appalachiana*), it was found in the southern Appalachian Mountains, and, unlike the others, drops its leaves in the fall.

People might guess that the closest relatives of the North American bamboos are from South America. But they're not; they're actually Asian. Genetic studies suggest that arrow bamboo, native to Japan, may be giant canes' next of kin, although they do not look very much alike. The arrow bamboo that giant pandas eat is the most abundant species at the Zoo.

Food for All

Only a few wild animals other than giant pandas consistently eat the leaves and stems of woody bamboos, which are low in nutritional value. The tough leaves and stems also require very strong teeth and jaws to crunch. Red pandas prefer tender new leaves, although they can crush tougher ones when necessary.

Shoots, however, find a place on the menus of many species. Shoots are the new growth of stalks that erupt from underground stems called rhizomes through which bamboo reproduces vegetatively. They are succulent, high-protein morsels, and abundant when they are in season. Giant pandas love them, as do takin, tufted deer, wild pigs, Asiatic black bears, and many other mammals that share the giant panda's bamboo forest habitat in China.

Golden bamboo lemurs, a critically endangered primate of Madagascar, are year-round shoot specialists. They dine almost exclusively on the shoots of a giant bamboo found only on that Indian Ocean island—despite the fact that these shoots are naturally laced with cyanide. These cat-sized animals ingest enough cyanide in a day to kill 12 similarly sized primates, without any apparent ill effects. How they cope with the poison is unknown, but related species haven't evolved the same capacity. The greater bamboo lemur eats only the pulp and culms of the giant bamboo, while the gentle bamboo lemur eats the shoots of a different bamboo species; both avoid the giant bamboo shoots.

Bamboo shoots are also seasonal favorites of eastern mountain gorillas in Africa. Large males gorge themselves on as many as 75 pounds of the tasty treats a day in the dry season, when the shoots form about 90 percent of their diet. These shoots are full of cyanide too, and the gorillas suffer from diarrhea during their shoot binges. Scientists suspect gorillas cope by eating a particular kind of soil with chemical properties similar to those of Kaopectate, which we humans use to treat diarrhea and upset stomachs.

People enjoy bamboo shoots as well. To get rid of the toxins, they boil the bamboo shoots in several changes of water. The majority of commercially available shoots come from just a few Asian species grown on plantations. A cultivated variety of one of these, *Phyllostachys edulis*, thrives on the Zoo's Asia Trail. Originally from China, this species is now grown for shoots as well as for construction material throughout Southeast Asia.

Although commercial harvesting doesn't affect giant panda food sources, local harvesting can affect giant pandas. In the spring, people swarm into the pandas' bamboo forests to collect bamboo shoots for personal consumption and local markets. The shoots are sometimes the same species that pandas eat, but even when they aren't, the presence of so many people in the forest may disturb the sensitive bears.

The four species of Asian bamboo rats are also confirmed bamboo lovers. These burrowing rodents live mostly underground, tunneling through the soil and munching on the roots of bamboo. On

Bamboo to the Rescue

With our animals' rapid bamboo consumption and an unexpected drop off in our bamboo regrowth, the Zoo was faced with a bamboo shortage this winter. We put out a call to area property owners for new sources of bamboo meeting the following criteria: more than one acre; located within a 30-mile driving distance from the Zoo; growing at least 100 feet from any road; and not treated with herbicides or pesticides.

We were barraged with offers of help, and are now faced with the gratifying task of sorting through the 400-plus potential new sources. "The response from the community has been tremendous," says Zoo nutritionist Mike Maslanka. "We have located a number of sizable stands that should meet our needs, as well as some smaller ones nearby that may serve as emergency stands." The Zoo's nutrition team has been making site visits to assess the bamboo, which will lead to later harvests.

"Folks have been calling with genuine concern for our animal collection and the desire to help the Zoo," he says. "We want to thank the community for the outpouring of support."

Nutritionist Mike Maslanka thanks the community for boosting the Zoo's bamboo supply.

JESSIE COHEN/ NZP

JESSIE COHEN/ NZP

JESSIE COHEN/ NZP

MEHGAN MURPHY/ NZP

JESSIE COHEN/ NZP

Bamboo in Asia (top, bottom) and at the Zoo (middle) is important to humans and wildlife.

the other side of the world, four South American bamboo rats, known as *coro-coro*, also rodents but not closely related to the Asian varieties, live in tangled bamboo thickets and eat the plant's leaves, stems, and shoots.

Many animals feast on bamboo seeds when they are available. And this brings us to the most enigmatic feature of bamboos. Most of these plants grow for a long time, spreading via the branching of their underground rhizomes and then, in one big burst, flower, set seeds, and die. What's more, all members of a species, or all those in a particular area, do this in waves over several years. The intervals between flowering events vary from three to 100-plus years, most often 15 to 60 years, depending on the species. Japanese timber bamboo, *Phyllostachys bambusoides*, found at the Zoo on Asia Trail, is the champ in this regard, waiting 120 years for its first flowering bout.

Scientists don't know what triggers mass flowering, or why bamboos have evolved this unique reproductive strategy. But some animals take advantage of the massive numbers of seeds that suddenly appear when an abundant species finally fruits. In Asia, rats of various species eat the seeds. After feasting, they reproduce prodigiously and plagues of rats end up invading human croplands and dwellings in search of food once the seeds are gone.

Many birds also eat bamboo seeds, and a few birds even specialize on them. Some South American species, including the critically endangered purple-winged ground-dove, follow the waves of seeding *Guadua* bamboo, moving nomadically in search of new patches, while the related maroon-chested ground-dove breeds in seeding *Chusquea* bamboo stands.

Many more birds, including insect-eating species, make their homes in bamboo thickets that are abundant in food. According to Birdlife International, more than 15 Asian birds live almost exclusively in bamboo and many more use bamboo as a significant part of their habitat. Similarly, in Peru, scientists have found 19 birds that live primarily in *Guada* bamboo. The bamboo foliage-gleaner not only lives in *Guada* thickets, it builds its nest inside the bamboo's two-and-one-half-inch diameter stems, which are hollow between the joints.

Three species of tiny Asian bats also roost in the hollow sections of large bamboo species. The largest of these, the greater bamboo bat, is less than two inches long, followed by the lesser bamboo bat, at about 1.5 inches, and the smaller still pygmy bamboo bat, which was discovered in China in 2007. All these bats have flattened skulls that enable them to slip into the bamboo stems through narrow slits created by beetles. As many as two dozen lesser bamboo bats may roost in a single hollow section averaging about ten inches long and nine inches in diameter.

Building With Bamboo

As important as bamboo is to a diverse array of wildlife, it is immensely important to people too. Some 1,500 different uses of bamboo have been recorded, including food, fuel, medicine, clothing, paper, musical instruments, tools, baskets, and building material. Today, bamboo is touted as a sustainable alternative to timber, and the cultivation of bamboo is promoted by groups such as the International Network for Bamboo and Rattan (INBAR) as a way to alleviate poverty among poor rural people in Asia, Africa, and South America. According to INBAR, "Virtually every product which is now produced from wood can be effectively produced from bamboo," and more sustainably, too, thanks to the swift growth of many species. *Phyllostachys bambusoides* reportedly grows 47.6 inches in a single day. Growth rates of a foot or more a day are common, and culms reach 60 to 80 feet in one growing season.

The fast and seemingly never-ending replacement of harvested bamboo stalks means that Zoo browse-cutters are never out of work—and the Zoo's bamboo-loving animals are never out of food.

—SUSAN LUMPKIN *is a freelance writer and avid gardener who is working on a book about rabbits.*

FACT OR FICTION?

Fish can't breathe air.

BRIAN GRATWICKE

You might gasp when the arapaima (*Arapaima gigas*) in the Smithsonian National Zoo's Amazonia exhibit breaks the water's surface to gulp air. This freshwater fish of the Amazon Basin breathes with its air bladder, a balloon-like pouch most fish use to float and sink. Arapaima evolved this makeshift "lung" to survive in low-oxygen parts of the Amazon Basin's waters, where gill-breathing fish may suffocate. The arapaima's air bladder takes over for its puny gills. The fish can hold its breath for ten to 20 minutes at a time, which helps it hunt smaller fish corralled into shrinking waterways during the dry season.

The monstrous-looking arapaima can grow to more than eight feet long and features large gray scales, pink splotches near the tail, and a flat head with jutting lower jaws only a mother could love. Or maybe a father—male arapaima carefully guard and transport their eggs inside their mouths. Few of these offspring, however, will grow to their gigantic potential because humans often harpoon arapaima feeding and breathing at the surface.

WHERE IN THE ZOO? »

Can you tell what this is?

Take a look at this closeup and see if you can tell what animal it is. Make your best guess, then visit **http://nationalzoo.si.edu/goto/whereinthezoo** to check your answer and learn more about this Zoo creature.

MEHGAN MURPHY/ NZP

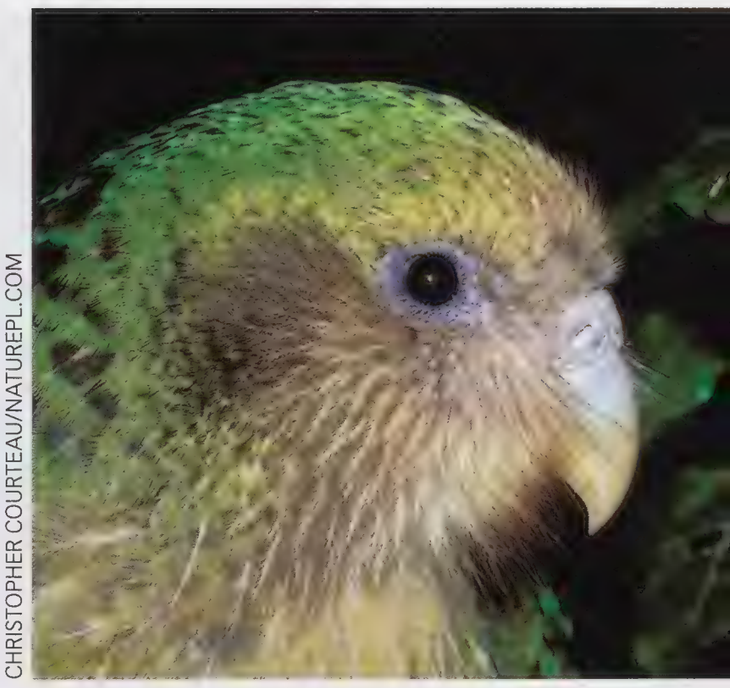
MEHGAN MURPHY/ NZP

DID YOU KNOW?

Which came first: the spider or its silk?

All spiders make this stringy stuff, but new research reveals that ancient arachnids (spider relatives) made silk before true spiders evolved. These early silk-makers lacked spinnerets, structures that funnel and guide a spider's fresh silk. Golden orb spiders in the Zoo's Invertebrate Exhibit use their spinnerets to weave intricate webs. The original silk-making arachnids, however, couldn't build webs. They may have bolstered their burrows with silk, built fluffy egg sacs, or laid silken trails to find their way home.

Scientists once thought the earliest known silk-maker, a fossil arachnid 386 million years old, was a spider. But closer examination by scientists from the University of Kansas and other institutions revealed that this animal (*Attercopus fimbriunguis*) not only lacked spidery spinnerets—it also had a tail, unlike any spider you'd see in the woods. The scientists booted it out of the spider order Araneae and into the newly-created order Uraraneida. Because of this arachnid's primitive silk machinery, scientists believe "spider silk" came before spiders. Now if only the old chicken-and-egg question had a clear answer!



CHRISTOPHER COURTEAU/NATUREPL.COM

SUPERLATIVE

Heaviest Parrot

Kakapo parrots (*Strigops habroptilus*) are adorably fluffy, gentle, and curious, but you might not want one on your shoulder. Some weigh as much as a light bowling ball—about eight pounds. Kakapos outweigh all other parrots, and unlike the rest, they can't fly. These big birds also present a weighty conservation challenge: Fewer than 100 exist today, strictly on island sanctuaries of New Zealand. Kakapos were decimated by human settlers and by invasive cats and other mammals, having no instincts to flee or attack these novel threats.

So not only are kakapos the heaviest, but they're also the Earth's rarest parrots and its only nocturnal ones. Some nights, male kakapos call to females miles away by making sonic booms using inflatable chest sacs. But females are ready to breed only when certain food plants, most notably the rimu tree, mast—or fruit profusely—and that only happens every few years. But this year, scientists expect a boom in rimu fruit—which they hope will lead to a boom in the kakapo population.

MEHGAN MURPHY/NZP

MOLE-RATS EXPOSED

The Damaraland and naked mole-rats break all the rules. First of all, they are neither moles nor rats. They're more closely related to porcupines and guinea pigs. Second, they are mammals that don't act like mammals. They live in an insect-like social system ruled by royalty. Last, they are so funny-looking they're cute.

BY PAM BUCKLINGER

Totally Tubular » Mole-rats live underground in huge networks of tunnels that can extend for miles. How are these tunnels formed? You're going to dig this! Mole-rats work together as a team. They form a line, nose to tail. The front mole-rat uses its teeth to dig away at the soil and then pushes it backward with its feet. Every rat behind him sweeps the dirt until it's kicked above ground. They make wide tubes (like highways) to handle lots of traffic and narrow tunnels (like two-lane roads) for less-traveled paths. Built into the tunnels are neatly separate kitchens, bathrooms, and nursery areas. Mole-rats might live in the dirt, but they aren't dirty!

The Royal Family » The Damaraland and naked mole-rats are the only mammals that live in social colonies ruled by a royal couple or queen. They have a distinct division of labor, including soldiers and workers that scout for food, clean the tunnels, babysit the pups, and defend the colony. The royals run a tight ship (or tunnel) and randomly inspect work. They even use physical force to make the laborers work harder. Hail to the queen!

Nudist Colony » Before you start to blush, naked mole-rats aren't really naked. They do have some hair, but they are the only rodent that lacks typical fur. Whiskers around their faces act as "curb feelers" to help them find their way through dark tunnels, and hair between their toes help them sweep. Without a built-in fur coat, they have a hard time staying warm, but they have a few tricks up their paws. The colony will huddle together to trap in heat, and, if that isn't enough, they will send one rat up to the surface to bask in the sun and then come back down for a heated group hug.

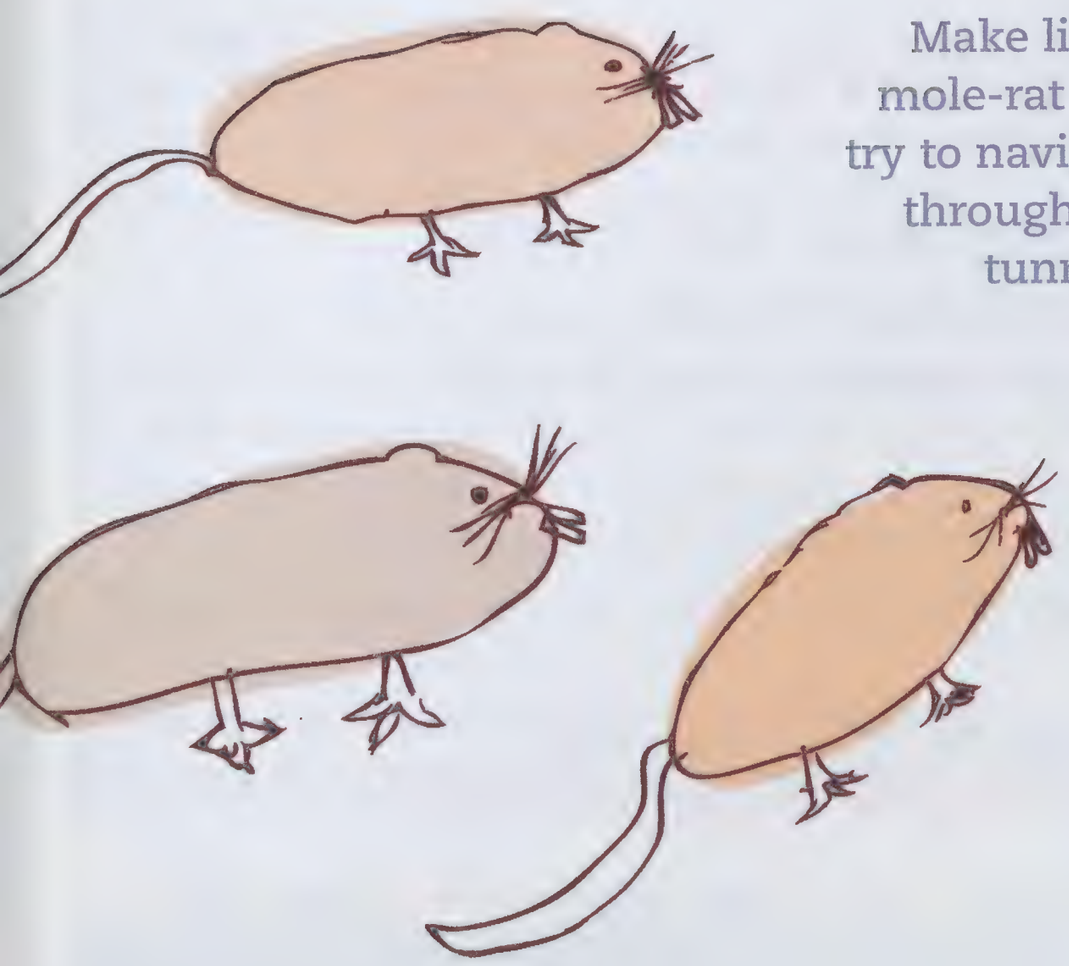
Also, unlike almost all other mammals, naked mole-rats do not have a well-developed layer of fat under their skin. That gives their skin a transparent look. When the queen is pregnant and close to delivery, you can actually see the developing babies inside her. Peekaboo!

Non-Naked Kin » More people are familiar with the naked-mole rat than its well-dressed cousin, the Damaraland mole-rat. Damaralands are furry all over, usually with a large white patch on their heads. They live underground too, but in smaller colonies. These rats are much larger in size and have much less to say, making only a few bird-like chirps. Like all rodents, they have four large teeth that grow throughout their lives. All that digging wears them down so they don't grow too long. Mole-rat lips are located behind their teeth. This way they can dig and dig without having a dirty mouth.

WELL-GROUNDED **FACTS**

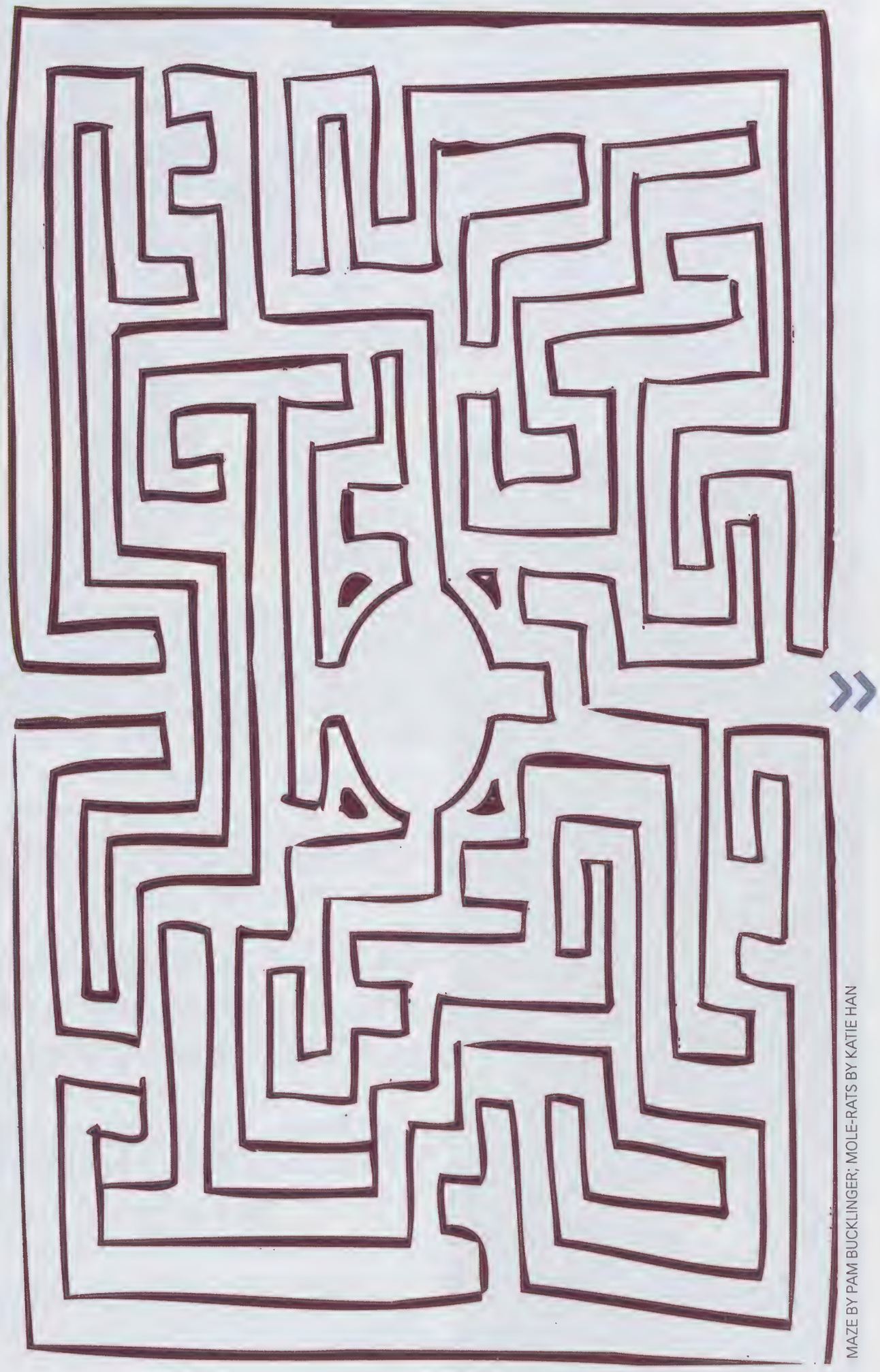
- Mole-rats don't see well so sometimes they run through tunnels with their eyes closed.
- When a naked mole-rat is crowned queen she physically grows bigger.
- Mole-rats eat their poop! By digesting twice they get all of the nutrients out of it.
- Naked mole-rats, like reptiles, can't regulate their own body temperature.
- At the Zoo, animal keepers trim mole-rats' long teeth with nail clippers.
- Mole-rats can run as fast backward as they can forward.

AT A GLANCE:	NAKED (*Heterocephalus Glaber*)	DAMARALAND (*Cryptomus Damarensis*)
WHERE:	East Africa	West Africa
DESCRIPTION:	pinkish gray, wrinkly	brown gray, furry
LENGTH:	3 inches	11 inches
COLONY SIZE:	Up to 300	Up to 40
RULER:	Queen	Breeding pair
NUMBER OF BABIES:	About 12, four times a year	About 2, once a year
LIFE SPAN:	10–30 years	About 10 years
VOCALIZATIONS:	Squeaks, grunts, growls	Chirps



START HERE

Make like a mole-rat and try to navigate through the tunnels.



MAZE BY PAM BUCKLINGER; MOLE-RATS BY KATIE HAN

BY MARY-RUSSELL ROBERSON

{ CONSERVATION STATION }

Go Native for Wildlife

AMERICAN BEAUTYBERRY/ISTOCKPHOTO.COM

If you want to support wildlife, conserve water, and add beauty to your yard, consider planting native trees and bushes. Not only do native plants thrive with less care, they also provide food and homes for wildlife. In the summer, sweet pepperbush produces fragrant blooms that attract bees and butterflies. In the fall, migrating birds feast on the purple berries of American beautyberry and red berries of deciduous hollies.

Native plants evolved in the region where they are growing, while exotic plants have been imported from other places. Also called invasives, many exotics, such as kudzu and wisteria, end up spreading aggressively because their new home is free of the predatory insects or pathogens that keep them in check in their native range.

"For the exotic plants, almost every one of them was brought here intentionally and planted," says Bill McShea, a research scientist in the Smithsonian National Zoo's Center for Species Conservation. "A lot of the invasives I'm dealing with now—autumn olive, Russian olive, buckthorn—were somebody's landscaping idea."

You can help combat the spread of invasives and offset habitat loss by landscaping with natives. Luckily, it's not hard to do, since native plants require little in the way of extra water or fertilizer. Choose plants that are native to your region and suited for the conditions in your yard. A shrub that grows along a coastal estuary might not thrive in a dry, high-elevation site.

For plant suggestions, check these resources:

- http://www.dnr.state.md.us/criticalarea/trees.html
- http://www.dcr.virginia.gov/natural_heritage/nativeplants.html
- http://www.deq.state.va.us/coastal/go-native.html

KAREN WARKENTIN/ BOSTON UNIVERSITY

[RESEARCH REPORT]

SMART EGGS

We don't typically think of frog embryos as having behavior. But in fact they do, according to research done at the Smithsonian Tropical Research Institute in Panama by undergraduate Jessica Rogge and professor Karen Warkentin, both of Boston University.

Red-eyed tree frogs (*Agalychnis callidryas*) lay their eggs on leaves overhanging ponds. The eggs stay on the leaves for a few days before tadpoles hatch and fall to the pond below. During this waiting stage, the embryos need a lot of oxygen, which diffuses from the air through the surface of the egg. However, the eggs are so closely packed together that each has only a small amount of surface area exposed to air. Oxygen levels in the parts of the egg farthest away from the air are much too low to support a growing embryo. Yet somehow the embryos thrive. Warkentin and Rogge wanted to know how.

They discovered that the embryos put their gills in a high-oxygen "sweet spot" near the part of the egg's surface exposed to air. Here's the amazing part: When Rogge manipulated the embryos so that their gills were deeper in the egg, the embryos immediately repositioned themselves so that their gills were in the sweet spot. This was the case even with one-day old embryos, which don't yet have gills or a heart. They moved themselves so that their developing head was in the sweet spot.

Interestingly, frog embryos also display other behavioral reactions. When they sense vibrations from a snake biting into their egg mass, they will hatch and drop into the pond below to escape.

Cockadoodle Zoo

Wake up and smell the conservation.

Start the day with your animal friends at the National Zoo. One morning a year, the Zoo is open exclusively to FONZ members.

Saturday, March 14, 2009
8 a.m.-10 a.m.

Use this page as your invitation/parking pass. Go to www.fonz.org/zoomorning.htm to print a schedule and map.

Cockadoodle ZOO

An event for FONZ members
Saturday, March 14, 2009
8 a.m.-10 a.m.

Use this page as your invitation/parking pass. Go to www.fonz.org/zoomorning.htm to print a schedule and map.

Rise and shine and head to the Zoo! Cockadoodle Zoo is our way of saying thank you for being a friend of the National Zoo.

One morning a year, FONZ members get the Zoo all to themselves. Come see firsthand how the Zoo's animals and keepers start their day. From baths to teeth brushing to breakfast, the animals' morning activities aren't all that different from yours!

Metro is the best way to get to the Zoo. If you drive, use the Harvard Street or Connecticut Avenue entrances. Use this page as your ticket into the Zoo and the event.

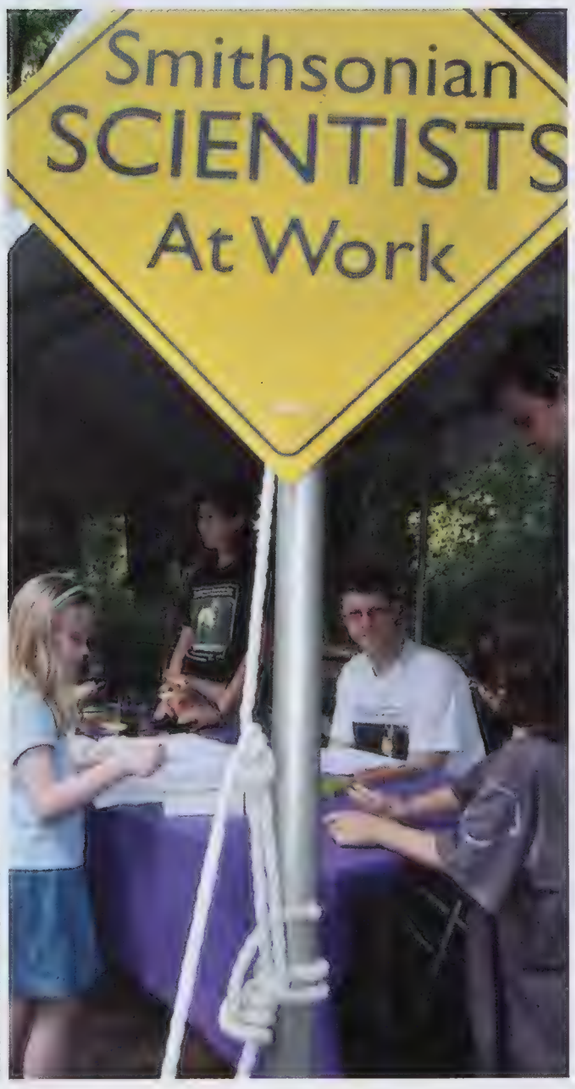
Hours
Event hours 8 a.m.- 10 a.m. Buildings and stores open at 8 a.m.

Share the fun!
Bring your friends. If your guest(s) decide to join FONZ at Cockadoodle Zoo, you will receive an additional ten percent discount in National Zoo stores (valid March 14 only). As you know, FONZ membership funds contribute to conservation projects that benefit the Zoo, the community, and the planet.

Parking
Parking is available on a first-come, first-served basis.Please follow traffic directions. A limited number of parking spaces in Lots A, B, and D are reserved for members with disabilities.

Metro
Take Metrorail and Metrobus to the Zoo. Exit the Metro at the Woodley Park-Zoo/Adams Morgan station or the Cleveland Park station (both on the Red Line). Then walk to the Zoo or take Metrobus Route L2 (Connecticut Avenue), or H2 (Harvard Street). For Metro information, call 202/637-7000 or visit www.wmata.com.

In-Zoo Shuttle Bus
A shuttle bus will run between Panda Plaza and the crossroads near Lion/Tiger Hill.



ELIZABETH WAGNER/NZP

UPCOMING EVENTS:

« Cockadoodle Zoo

March 14, 8 a.m.-10 a.m.

Tear out the preceding page and bring it to this popular members-only event. You'll get a peek at how the Smithsonian's National Zoo wakes up for springtime.

NICOLE POPOVICH/ NZP

Easter Monday: Celebrating the African American Family»

April 13, 10 a.m.-4 p.m.

For about 100 years, African Americans have celebrated Easter Monday at the National Zoo. Activities include crafts, music, dance, and an Easter egg roll and hunt.

Grapes with the Apes

April 16, 6 p.m.-9 p.m.

Join your friends and raise a glass to wildlife conservation at the Zoo's premier wine-tasting event. Spend an evening sampling wine from vintners across the region. Find out more at www.fonz.org/afterhours.htm.

Earth Day Celebration

April 18, 8 a.m.-10 a.m.

Help us keep the Zoo and its surrounding ecosystem healthy. Join us for a pre-Earth Day clean up. Check www.fonz.org/earthday.htm for details.

Bird Fest 2009

CELEBRATE INTERNATIONAL MIGRATORY BIRD DAY AT THE ZOO:

Lecture and Book Signing

April 30, 7:30 p.m.

Join British ornithologist Nigel Collar as he discusses his latest book, *Birds and People: Bonds in a Timeless Journey*.

Bird Fest

May 2-3, 10 a.m.-4 p.m.

Check out interactive displays about bird conservation, make family-friendly crafts, meet live birds of prey, watch bird-banding demonstrations, and enjoy a live performance by Evergreen Theater.

Go to www.http://nationalzoo.si.edu/birdfest for more information.

FONZ

Check this FONZ section in each issue of *Smithsonian Zoogoer* for important member news about Zoo events, classes, camps, and more. For more information, visit **www.fonz.org.**

FONZ Resources
www.fonz.org

Membership information
202.633.2922

FONZ special events
202.633.4470

Development office
202.633.3033

Camps and classes
202.633.4470

Volunteer services
202.633.3025

Comments? Questions? Please email us at **member@fonz.org**

EVENT WRAP-UP

WOO HOO!

Our Valentine event, **Woo at the Zoo**, got hearts a-beatin'. Thank you to our sponsors: Whole Foods Market, MIX 107.3 FM, and Yelp.

FONZ
CLASSES

ADULT/CHILD CLASSES

» These programs are designed to allow adults and children to discover the Zoo together. All children must be accompanied by an adult. For the safety and enjoyment of everyone, unregistered children and siblings may not attend—with the exception of infants who are not yet crawling.

Children's classes and programs are open to FONZ members at the Household level and higher categories only. All classes meet in the Visitor Center unless otherwise noted.

Register online at: **www.fonz.org/classes.htm.**

HEAR and Now

FONZ is pleased to bring the Humane Education Ambassador Reader (HEAR) program reading initiative to the Zoo. HEAR is a community-based literacy program designed to help children develop compassion and empathy while building their listening and critical thinking skills.

Come and joins us as we read and discuss "So, What's it Like to be a Cat?" Learn the similarities and differences between house cats, great cats, and people.

AGES 5-8 (with an adult)
DATES Session 1 : April 4
Session 2 : May 9
TIME 12:30-1:15 p.m.
FEE Free (registration is encouraged but not required)

Funny Bunnies

What has soft fur, is sometimes blue when it's born, and is cuddly as a teddy bear? Hop to the Zoo to find out all about silver fox rabbits, and meet them at Kids' Farm.

AGES 2-3 (with an adult)
DATES April 11
TIME 10-11:30 a.m.
FEE $25

MEHGAN MURPHY/ NZP

Spots and Stripes

Take a closer look at the animal kingdom's boldest patterns. This class explores zebras, tigers, and other eye-popping animals. Play with patterns and visit the Zoo's most conspicuous creatures.

AGES 2-3 (with an adult)
DATES Session 1: April 20, 27; May 4, 11, 18
Session 2: April 22, 29; May 6, 13, 20
Session 3: April 23, 30; May 7, 14, 21
Session 4: April 24; May 1, 8, 15, 22
TIME 10-11:30 a.m.
FEE $100

MEHGAN MURPHY/ NZP

JESSIE COHEN/ NZP

Animal Families

There are all types of families, especially in the animal world. Did you know that some dads have babies? Or that some family groups build nurseries? See how these amazing social animals work together to guard their homes and protect their queens!

AGES 3-5 (with an adult)
DATES Session 1: April 23, 30; May 7, 14, 21
Session 2: April 24; May 1, 8, 15, 22
TIME 1-2:30 p.m.
FEE $100

What's in an Egg?

Big or small, colored or speckled, eggs contain all kinds of creatures. Through crafts and hands-on activities, learn what makes eggs so special, and go on an egg hunt to find out what's hidden inside.

AGES 2-3 (with an adult)
DATES Session 1: May 2
Session 2: May 3
TIME 10-11:30 a.m.
FEE $25

Talk Like the Animals

Whistle, grunt, roar, and sing to find out how animals communicate with each other. Come meet the Zoo's noisiest residents and make some noise of your own.

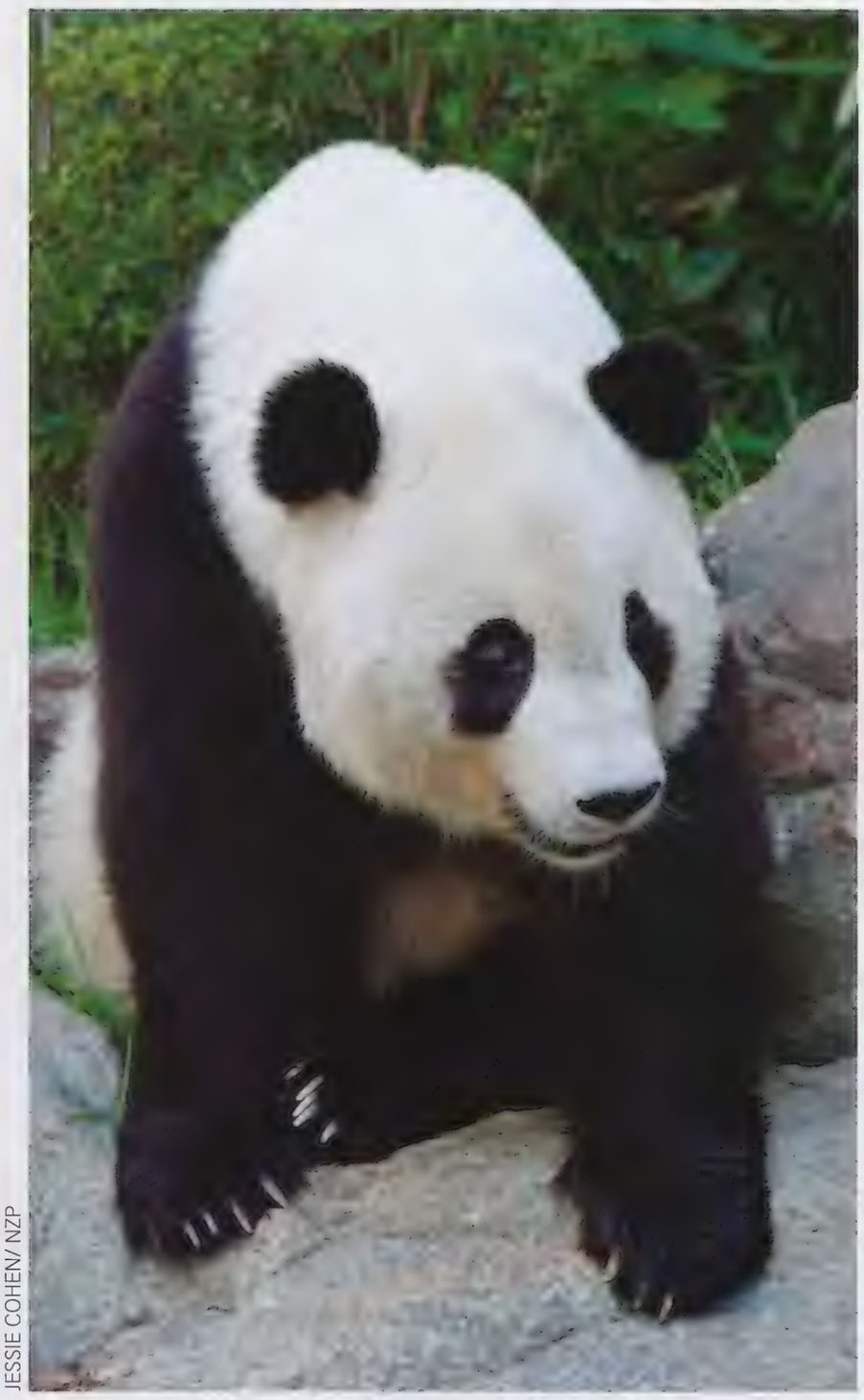
AGES 2-3 (with an adult)
DATES Session 1: May 16
Session 2: May 17
TIME 10-11:30 a.m.
FEE $25

Walk Like the Animals

Furry, flat, wide, or webbed? Feet aren't just for walking. Come explore the wacky world of feet and take a walk on the wild side around the Zoo.

AGES 2-3 (with an adult)
DATES Session 1: May 30
Session 2: May 31
TIME 10 a.m.-12 p.m.
FEE $25

JESSIE COHEN/ NZP



JESSIE COHEN/ NZP

CHILDREN'S WEEKEND WORKSHOPS » Children's workshops are for kids ages four to 14. Specific ages are indicated in each class listing. Parents are not encouraged to stay with the class, but may if they wish. There is no charge for an adult who attends with a child.

Go With the Flow

Explore the world of boneless wonders, from beautiful comb jellyfish to giant octopus and fascinating cuttlefish. Participate in hands-on activities and get up close and personal with the Invertebrate Exhibit's watery world.

AGES 4-5
DATES Session 1: March 28
Session 2: March 29
TIME 10 a.m.-12 p.m.
FEE $28

Dr. Zoolittle

Put on your lab coat and take on the role of a young research scientist while meeting some of the animals that Zoo scientists are working to save. Examine slides and animal artifacts under a microscope to find out what it takes to care for animals at the Zoo and in the wild.

AGES 6-9
DATES Session 1: April 4
Session 2: April 5
TIME 10 a.m.-12 p.m.
FEE $28

Awesome Amphibians

Did you know that a third of the world's amphibians are in danger of extinction? Come and learn all about the amphibians that live at the Zoo and in the wild, and hop into action to save our froggy friends!

AGES 4-5
DATES Session 1: April 25
Session 2: April 26
TIME 10 a.m.-12 p.m.
FEE $28

The Incredible Journey

You don't need your passport to set your mind in motion in this class that explores animal travels. Celebrate International Migratory Bird Day and learn about birds that can travel up to 40,000 miles a year. Then, dive into fun while learning about turtles and whales. Get a move on! Sign up today!

AGES 6-9
DATES May 9
TIME 10 a.m.-12 p.m.
FEE $28

A Day in the Life of Tai Shan

Get to know our youngest panda, Tai Shan, beyond his cute and cuddly exterior. Find out all about his daily activities and discover how much panda cubs and human kids have in common!

AGES 4-5
DATES Session 1: May 16
Session 2: May 17
TIME 10 a.m.-12 p.m.
FEE $28

Cheetah Challenge

Did you know that a cheetah can reach a speed of 45 miles per hour in less than three seconds? In this high-energy class, challenge yourself and see how humans compare to the world's fastest land animal. You'll also find out what scientists are doing to help this endangered cat in its race for survival.

AGES 6-9
DATES May 30
TIME 10 a.m.-12 p.m.
FEE $28

Get a jump on registering for our camps and overnight programs! FONZ members at the Contributing level ($100) and higher can register one week early for any **Snore & Roar program** on March 31.

» » » » »

If you aren't already a Contributing member, you can upgrade your membership today at **www.fonz.org/upgrade.htm.**

This is no ordinary camping trip!

Imagine waking up to the roar of powerful lions or hearing the early morning call of playful gibbons. Come spend the night at the Smithsonian's National Zoo during a Snore & Roar event. It's the best way to see the Zoo's animals after hours and enjoy the park all to yourself. Your overnight will begin with a two-hour, keeper-led tour of an exhibit area. Then later, flashlight in hand, you will hike through the Zoo and check out awesome nocturnal animals. That night you will sleep in a tent on Lion/Tiger Hill. Your adventure will conclude the next morning with a Continental breakfast and a family-friendly morning activity.

Snore & Roar overnights take place between June and September. Online registration will begin on April 7, at 10 a.m.

Find a schedule at www.fonz.org/snoreandroar.htm

FONZ MEMBERS ONLY To sign up, you must hold a current FONZ Household membership or higher. Adult-only Snore & Roars are available to all membership levels. Participants in family overnights may bring two additional children as guests. A maximum of six participants may sign up per registration. Snore & Roar campers sleep in a four-person tent. Participants are never asked to share their tent with a stranger. Large groups cannot be accommodated.

Upgrade to a Donor membership level (Contributing and higher) and register for Snore & Roar one week early. Priority registration begins online at 10 a.m. on March 31.

AGES Adults and children ages six and up. A paying adult must accompany anyone under 18 and one adult must chaperone every three children. Participants in adults-only overnights must be at least 21 years old.

TIME 6 p.m. to 9 a.m. the following day. A small snack is provided, but participants should eat dinner before coming to the Zoo. All Zoo restaurants close at 5 p.m.

SNORE & ROARS ARE NOT JUST FOR KIDS! Adults-only programs include wine and cheese, a two-hour, keeper-led tour, flashlight walk through the Zoo, and continental breakfast.

JESSIE COHEN/ NZP

Tour Choices —

Your overnight begins with a two-hour keeper-led tour of one of the following exhibit areas:

Amazonia Take your family on an Amazon adventure where you'll have an evening encounter with poison dart frogs, arapaima, freshwater rays, and free-ranging monkeys.

FEE: $65 per person

Asia Trail A true after-hours hot spot in the heart of D.C., our Asia Trail is a hub of activity at night with sloth bears, clouded leopards, fishing cats, Asian small-clawed otters, and red pandas. Please note: giant pandas are not part of this tour.

FEE: $100 per person

Beaver Valley Learn about North American animals, including beavers, river otters, bald eagles, and Mexican wolves. They're sure to get your sea lions and seals of approval!

FEE: $65 per person

Bird House The bird house is home to hundreds of birds from all around the world. Visit with a keeper and meet our fine-feathered friends, from toucans to North Island brown kiwis, and everything in between.

FEE: $65 per person

Cheetah Conservation Station Chase a cheetah before catching some zzz's. Learn about some of their neighbors at the Zoo, including dama gazelles, scimitar-horned oryx, maned wolves, and Grevy's zebras.

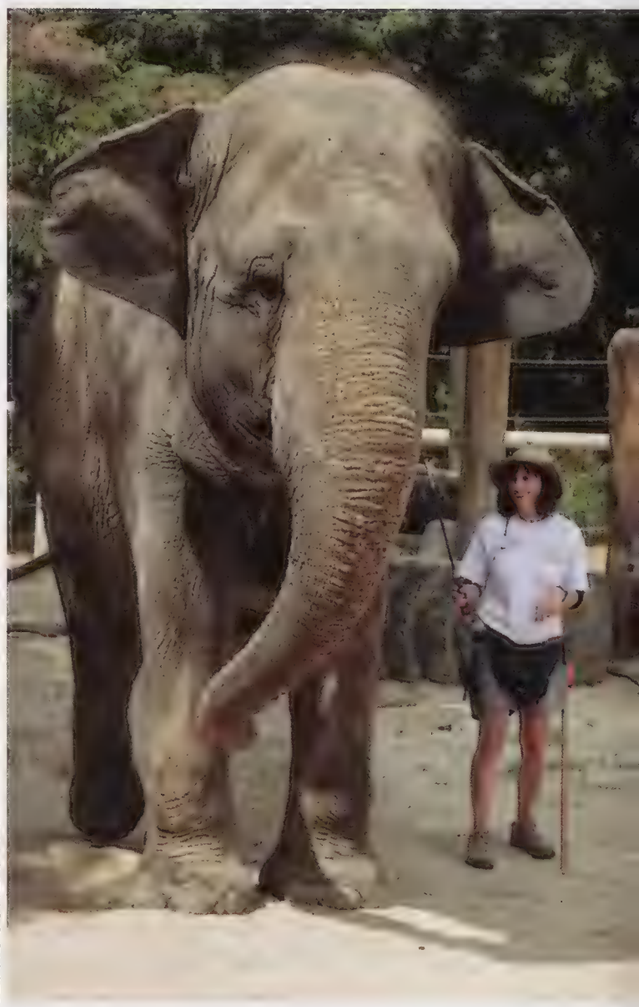
FEE: $100 per person

Commissary Some food for thought: What does it take to feed a 9,000-pound elephant? Meet a Zoo nutritionist and go on an exclusive, behind-the-scenes tour to see where all of the diets for the Zoo's animals are designed and prepared.

FEE: $65 per person

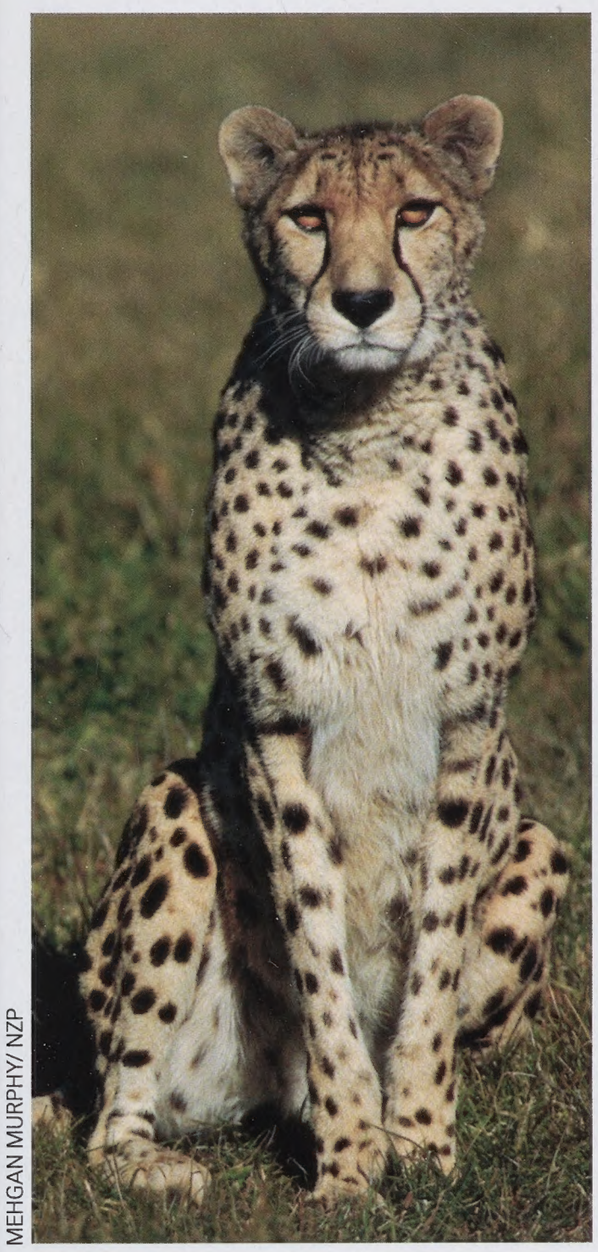
Elephant House You're guaranteed some big fun when you visit the largest living land mammal at the Zoo's Elephant House. Learn about the Zoo's plans for the new exhibit, Elephant Trails.

FEE: $65 per person



JESSIE COHEN/ NZP

CANCELLATION POLICY: To receive a 75-percent refund, you must provide written notification via email or regular mail at least four weeks before your Snore & Roar date. No refunds or changes will be made thereafter. Snore & Roar overnights go on rain or shine.



MEHGAN MURPHY/ NZP

JESSIE COHEN/ NZP

Great Cats No time for a cat nap, here's your chance to learn about lions and tigers and meet the other animals cared for by the Great Cats staff, including fishing cats, coatis, and spectacled bears.

FEE: $100 per person

Invertebrates While we're used to referring to them as "creepy crawlies," it is our friends at the Invertebrate Exhibit that are the spineless ones. Learn about the giant Pacific octopus, corals, golden orb spiders, and more.

FEE: $65 per person

Kids' Farm Moo-ve on down to the Kids' Farm for a hands-on lesson on what it takes to care for the alpacas, donkeys, goats, pigs, rabbits, and cows that call the Zoo home.

FEE: $65 per person

Reptile Discovery Center You'll have a guaranteed smile for every reptile you encounter in this fascinating exhibit, from giant anacondas to the Panamanian golden frogs, which are likely extinct in the wild.

FEE: $65 per person

Small Mammals While you're out there roughing it, our mini-mammals will be fluffing it. See lemurs leaping, monkeys monkeying around, and mole-rats being naked.

FEE: $65 per person

Scout Snooze

When it comes to camping with exotic animals, nothing beats the Smithsonian's National Zoo. Your troop's overnight will include wildlife-related activities and a flashlight tour of the nocturnal residents at the Zoo.

Scout Snooze campers sleep on Lion/Tiger Hill in four-person tents provided by FONZ. In the morning, an animal keeper leads campers on a two-hour tour of an exhibit area. An evening snack and continental breakfast are provided.

Scout Snooze sleepovers are available only to FONZ members. To sign up, one adult per scout group must have a FONZ Household membership (or higher). Scout leaders may assign tent arrangements.

AGES Children ages six and older. A paying adult must accompany all participants under 18, and one adult is required to chaperone every three children.

TIME 6 p.m. to 9:30 a.m. the following day. A small snack is provided, but participants should eat dinner before coming to the Zoo. All Zoo restaurants close at 5 p.m.

FEE $550 for up to ten people (including adults), $55 for each individual after ten and up to 20 participants.

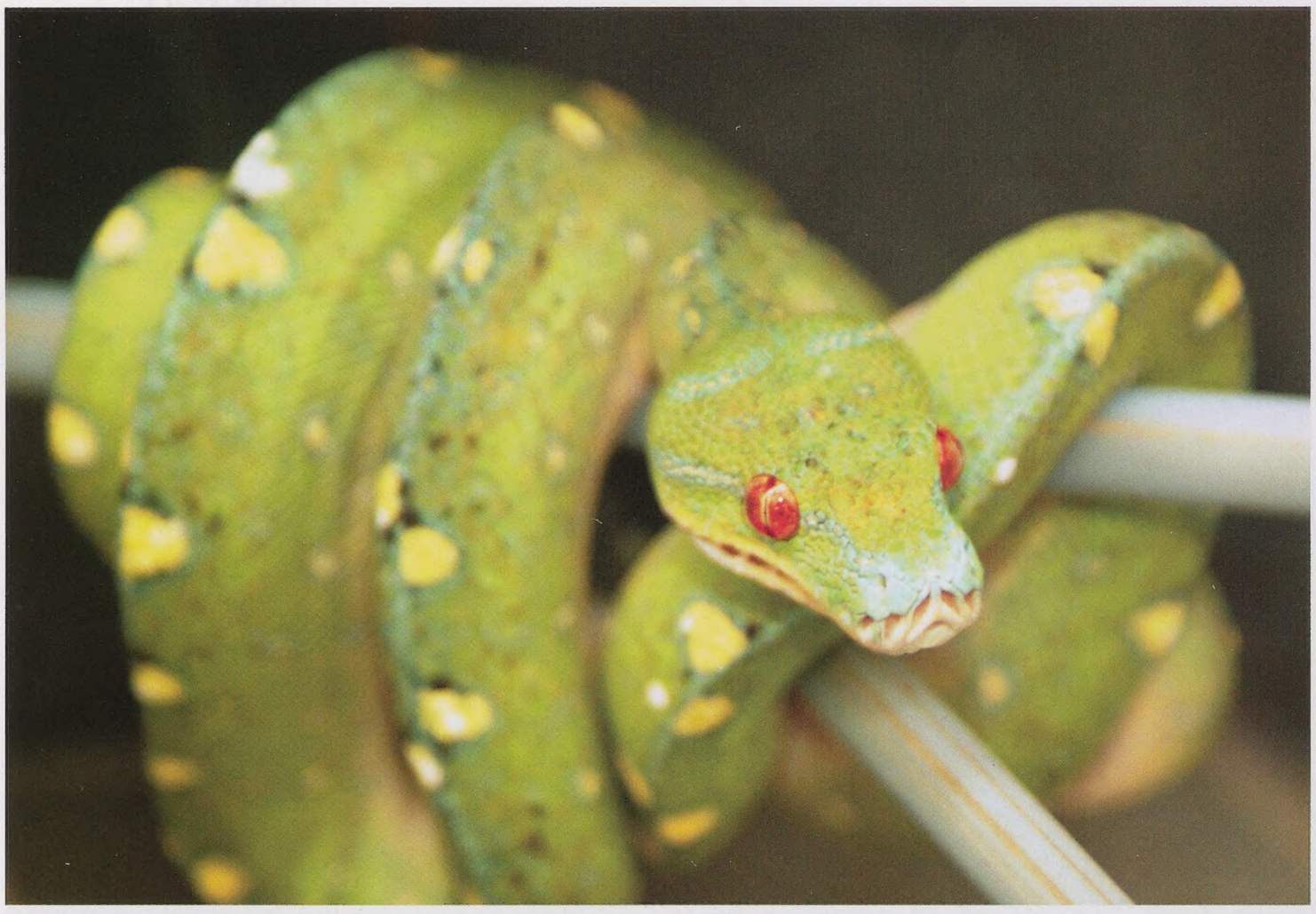
Scout Snooze Programs:

For the Birds: Fly up to the Bird House to explore birds at the Zoo and in Rock Creek Park.

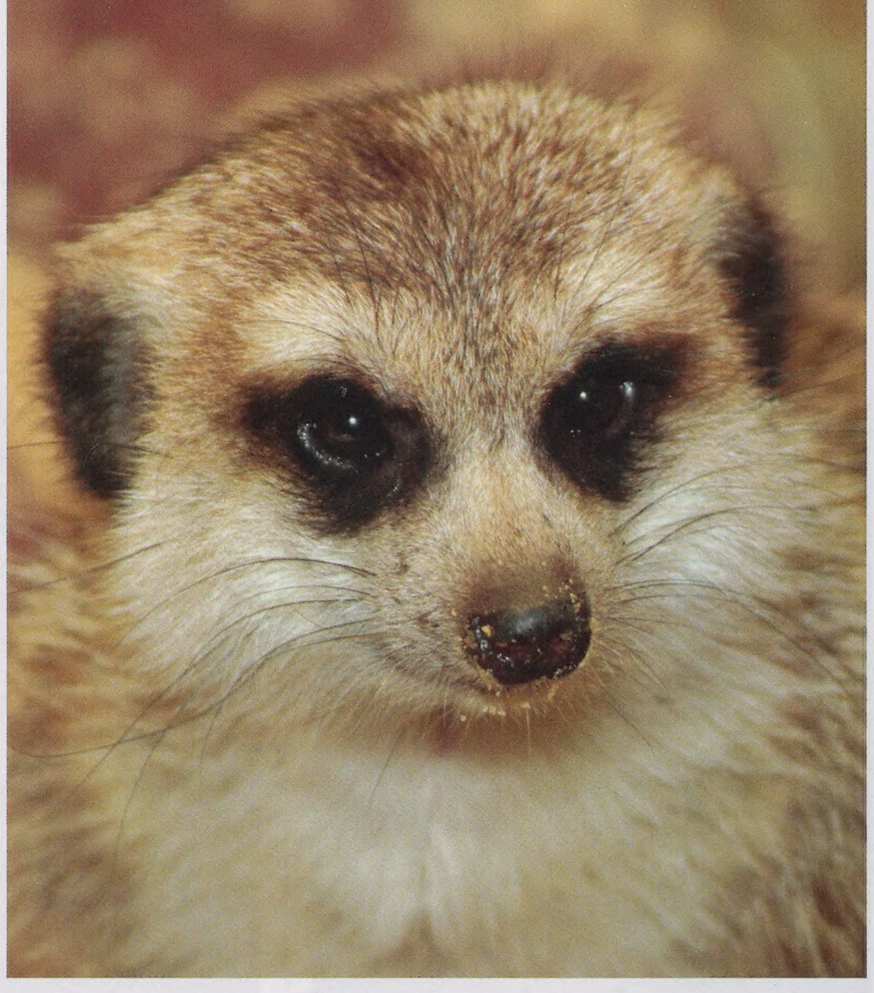
No-Bone Zone: Discover the Zoo's spineless wonders at the Invertebrate Exhibit.

Fun on the Farm: Help National Zoo animal keepers care for animals at Kids' Farm.

What's for Lunch: Go behind the scenes to learn about our small mammals and find out what they eat.



MATT EVANS/ ZOO BIOLOGIST



JOAN AXILBUND/ FONZ VOLUNTEER

MEHGAN MURPHY/ NZP

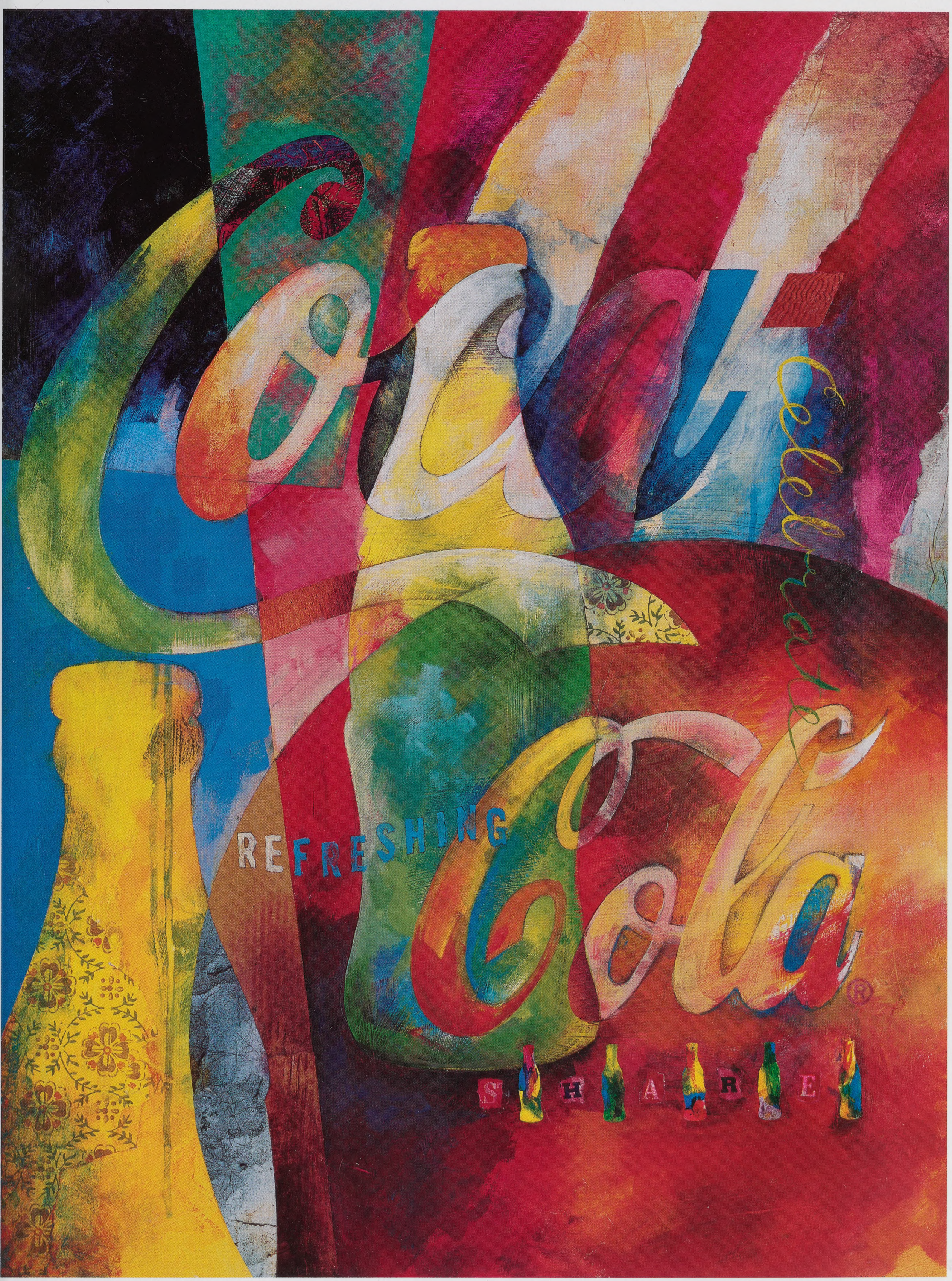
JESSIE COHEN/ NZP

Best of Zoos

Our animals and talented staff won top prizes in the Association of Zoos and Aquariums (AZA) annual photo contest. First place went to Smithsonian National Zoo photographer **Mehgan Murphy** for her magnificent photo of Luke, our male lion, gazing skyward. Honorable mentions were awarded to: Zoo photographer **Jessie Cohen** for her striking shot of a kori bustard; Zoo biologist **Matt Evans** for his vivid image of a green tree python; and longtime FONZ volunteer **Joan Axilbund** for her closeup of a meerkat. The contest draws hundreds of entries from staff and volunteers at AZA-accredited institutions.

SEND YOUR PANDA PHOTOS
The National Zoo and Fujifilm invite you to submit your favorite giant panda photos for a chance to win prizes provided by Fujifilm. Every other month, up to 25 photos will be selected at random and posted on the Zoo's website. If your photo is selected, you will be entered into a sweepstakes; winners will be drawn every two months. For more info, visit http://nationalzoo.si.edu/goto/FujifilmSweepstakes.

CAPTURE THE SEASONS
Submit your photos to *Smithsonian Zoogoer* for a photo feature that will run in our January/February 2010 issue. Photos should showcase a particular season of the year at the Zoo. Only FONZ members may participate; limit four photo submissions per individual. Please email your photos to zoogoer@si.edu by November 10, 2009.


REFRESHING
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FONZ
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Friends of the National Zoo, PO Box 37012, MRC 5516, NW, Washington, DC 20013-7012, **www.fonz.org**

Smithsonian
National Zoological Park

Saving gorillas with cell phones. Now that has a nice ring to it.

Recycle your old phones at the Zoo's Visitor Center.
Cell phones contain coltan, a mineral found in Africa where gorillas live.
Coltan mining has led to a dramatic reduction in gorilla habitat.
Recycling old cell phones—and only buying new ones when needed—will help reduce the demand for coltan.
Together, we can save gorillas one cell phone at a time.
Nature is calling, and we're not hanging up!

Recycle your phone at the Zoo, and while you're here, don't forget to meet the baby gorilla born on January 10.

Answer the call of the wild.